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SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF MICROGRAM QUANTITIES OF FE(II) AND FE(III) USING TAXIM-AZ

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ABSTRACT

Taxim-AZ reagent is used for the simultaneous determination of Fe(II) and Fe(III). This reagent gives colour complexes in acidic medium with the metal ions. The maximum absorbance is at 575 and 600nm for Fe(II) and Fe(III) respectively.

KEYWORDS: Spectrophotometric, Taxim-AZ and Fe(II) and Fe(III).

1. INTRODUCTION

Iron is used in large quantities than any other metal. Iron is also the most important transition element in plants and animals. Iron is essential in small amounts for both plant and animal life. Biologically iron is the most important transition element.

Pure iron is silvery in colour and it is not very hard and is quite reactive. The rusting of iron is special case of corrosion and is of great practical importance. The process is very complex. The present investigation is a simple and selective method for the determination of Fe(II) and Fe(III).

Taxim-AZ is a combination of cefixime and Azithromycin. Cefixime is a cephalosporin antibiotic and it is used to treat and cure bacterial infections. It is often used to treat Sinusitis, Tonsillitis, Bronchitis, Pneumonia, Cystitis, Kidney infections and Gonorhoea. Azithromycin

prevents bacteria from producing the proteins that are required to help them reproduce. It is a fast acting antibiotic which is used to treat a wide number of bacterial infections.

2. MATERIALS AND METHODS

Digital pH meter model CL21 (Elico) was used for measuring the pH of the buffer solution and Shimadzee 160A microcomputer based UV-visible spectrophotometer equipped with 1.0cm quartz cells used for all absorbance studies and amplitude measurements.

3. REAGENTS

All the reagents used were A.R. grade. All the solutions were prepared with doubly distilled water. Stock solutions of Fe(II) and Fe(III) were prepared by dissolving required quantity of their salts in analytical balance and transferring it to a standard flask, dissolving and making upto mark using double distilled water. The drug solution is prepared by dissolving exactly 100mg sample of Taxim-AZ in 100ml volumetric flask and the solution is made up to the mark with double distilled water.

4. EXPERIMENTAL SOLUTION

One ml of Taxim-AZ solution and one ml of metal ion solutions are taken in a 10 ml standard flask. The solution is made up to the mark and shaken well for uniform concentration. Similarly a blank solution without drug is prepared. The absorption spectra are recorded.

5. RESULTS AND DISCUSSION

The absorption spectrum obtained with Fe(II) and Taxim-AZ is presented in Table-1. An analysis of the spectrum reveals that the wavelength corresponding to the maximum is 575nm, at pH 6.0.

EFFECT OF pH

Table – 1

[Fe(II)] = 1 x 10^{-4}M   [Taxim-AZ] = 1 mg/ml

S.No	pH	Colour	λ_{max} nm	Remarks
1	1	No colour	---	---
2	2	No colour	---	---
3	3	No colour	---	---
4	4	Light yellow	550	Colour forms after 10 minutes
5	5	Yellow	560	Colour formed after 5 minutes

6	6	Yellow	575	Immediately colour is formed
7	7	Light yellow	555	Colour formed after 10 min
8	8	No colour	---	---
9	9	No colour	---	---
10	10	No colour	---	---

Iron(II) concentration is varied and its effect on absorbance value is studied. In the range of 0.698 to 4.88 µg/25ml linear relationship exist between Fe(II) and absorbance. The data is presented in Fig-1.
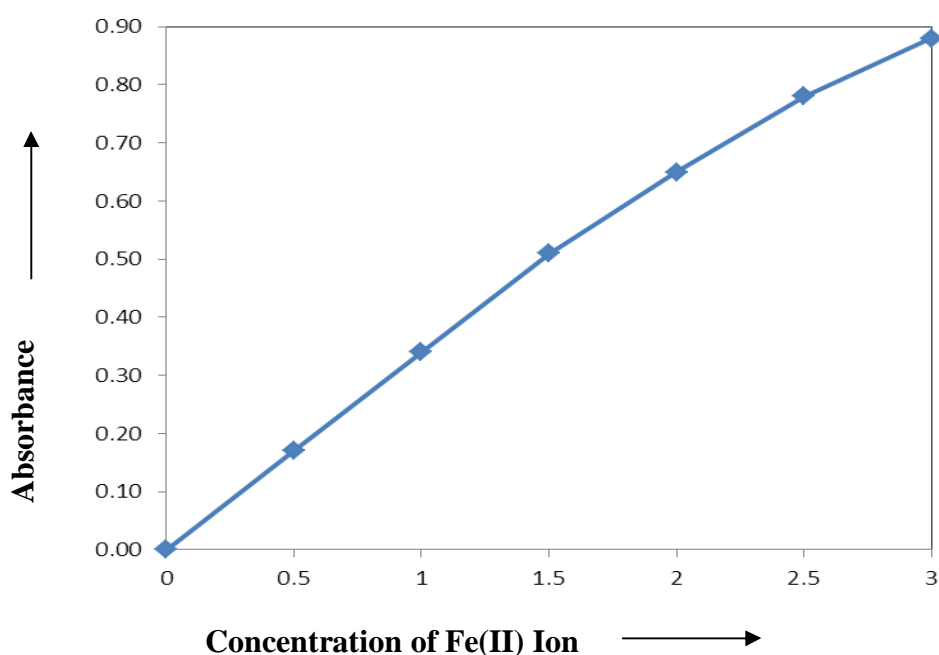

Fig – 1

pH=6 [Fe(II)] = 1×10^{-4}M

The concentration of Taxim-AZ is varied in the range of 0.1 to 0.6 mg/ml and the absorbance values are measured at 573nm against a blank solution. In view of the linear proportionality between the two parameters the Taxim-AZ can be determined in this range. The data is presented in Fig-2.
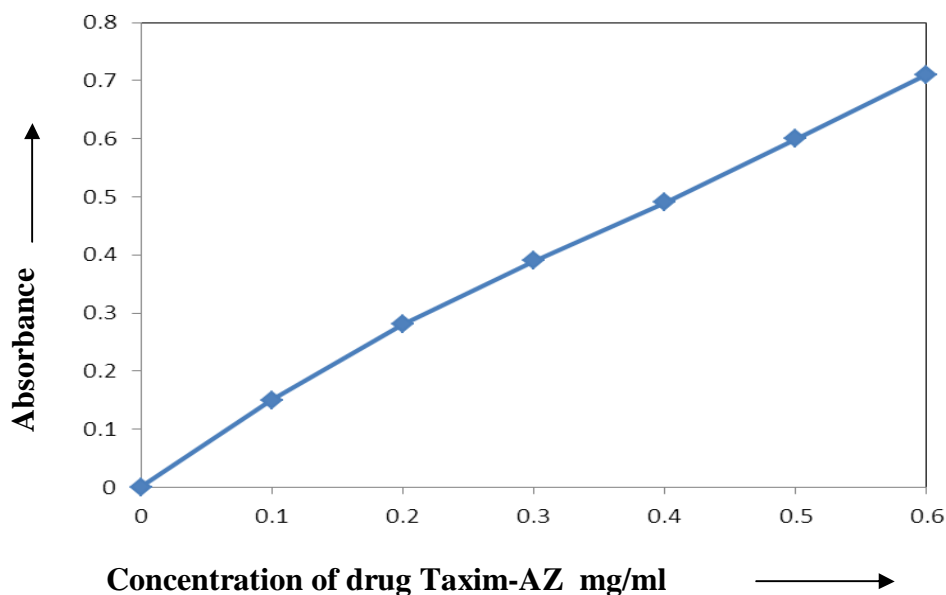
Concentration of drug Taxim-AZ mg/ml ⟶

Fig - 2

pH=6 [Fe(II)] = 1x10^{-4}M

Job's continuous variation method is performed in order to determine the composition of Iron(II) and Taxim-AZ. The results revealed a 1:1 complex between the metal ion and the drug. The data is presented in Fig-3.

Jobs Method
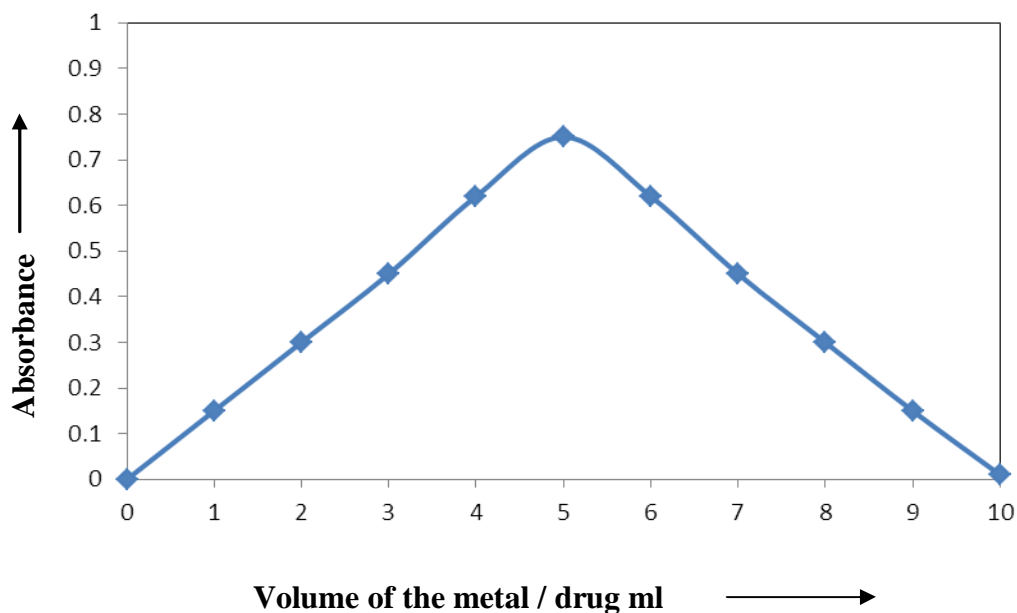

Volume of the metal / drug ml ⟶

Fig - 3

Generally the non-aqueous solvent influence a complexation reaction. Studies were made in presence of organic solvents (50% by volume) methanol, DMF, acetonitrile, dioxane and

acetone. The data is presented in Table-2. From the results revealed that the change in absorbance is not much, when methanol, acetonitrile and propanol are used. But when acetone is used the absorbance value decreased.

Table - 2

Effect or organic solvents on absorbance

pH=6   [Fe(II)] = 1 x 10^{-4} M   Taxim-AZ]= 0.5 mg/ml λ_{max} = 575 nm

S.No	Organic solvent	Absorbance
1	No solvent	0.20
2	Methanol	0.21
3	Acetone	0.15
4	Propanol	0.21
5	Acetonitrile	0.22

Similar experiments were conducted with Iron(III) and the results are tabulated in Table-3.

Table - 3

A comparative account of Fe(II) and Fe(III) Taxim-AZ systems

Metal ions	λmax	Range mg/ml	pH chosen
Fe(II)	575	0.698 to 4.88 μg/25ml	6
Fe(III)	600	0.698 to 4.88 μg/25ml	4

6. CONCLUSIONS

Taxim-AZ reagent is used for the simultaneous determination of Fe(II) and Fe(III) in acidic medium in microgram quantities. The present method is simple, rapid, sensitive and selective and do not involve heating or filtration or separation for the determination of metal ion and Taxim-AZ in the range of 0.73 to 5.15 μg/25ml and 0.1 to 0.6 mg/ml respectively.

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