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Assay of Rifampicin in Bulk and its Dosage Forms by Visible Spectrophotometry using Chloranilic Acid

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ABSTRACT

The electron donor- acceptor complex of the proposed method is simple, rapid and sensitive with reasonable precision and accuracy. The precision of the method was found by analyzing a set of eight solutions, each containing a final concentration value approximately in the middle of the Beer's law range. The percent relative standard deviation in this method is presented in table-2. The accuracy of the method was determined by taking different known amounts (with in Beer's law limits) of the drug and analyzing them by proposed method. The results are given in table – 3. In the determination of Rifampicin the excipients usually present in formulations (glucose, starch, sodium hexa phosphate and some vitamins) and the other antibiotics such as cycloserine, streptomycin, lidocaine or penicillins did not interfere.

Keywords: Rifampicin, Spectrophotometer, Chloranilic acid, Electron donor- acceptor complex.

INTRODUCTION

The formation of outer complexes or electron donor acceptor (EDA) complexes between quinones and amines is well known. These complexes are usually characterized by an intermolecular charge – transfer absorption band which often appears in the visible region. The energy of the band for a given complex agrees well with the electron donating and accepting properties of the two components [1] . In some cases more than one intermolecular charge-transfer transition is observed [2].These could correspond to transitions from the highest filled and the penultimate filled levels in the donor to the lowest empty level in the acceptor. The complexes with tertiary amines persist for a long time without further chemical reaction, although such subsequent reactions are dependant to a great extent, on the nature of the solvent[3,4] with most aromatic amines, the EDA complex fades with time because of other reactions which lead eventually to substitution (usually disubstitution in the 2^{nd} and 5^{th} positions).

Chloranilic acid is an yellow crystalline substance only slightly soluble in water, but soluble in many common organic solvents. It has a fairly high electron affinity[5] (1.4.e.v) and it is known to be a strong electron acceptor forming complexes with various Lewis bases. These reactions have been interpreted in terms of charge – transfer theory as proposed by Mulliken[6]. Although complexes of chloranilic acid with polycyclic aromatic hydrocarbons have been studied in detail[7,8]. little attention has been given to the n – Π charge – transfer complexes of chloranilic acid [9]. Chloranilic acid has been largely used in the determination of aromatic amines[10,11] amino acid [12,13] carboxylic acids and their salts[14].

The present work describes the spectrophotometric determination of rifampicin in bulk samples and dosage forms at pH 7.0.

MATERIALS AND METHODS

Preparation of reagents

Chloranilic acid

It was prepared by dissolving 100mg of analytical grade compound in 100ml methanol.

Rifampicin

It was prepared by dissolving 100 mg of Rifampicin (USP grade) in 100 ml of methanol.

Buffer solution (pH=7.0)

It was prepared by mixing 38.8 ml of potassium dihydrogen phosphate (0.06M) and 61.2 ml of disodium hydrogen phosphate (0.06M).Other reagents and solvents were of analytical grade.

Instrumentation

Spectral and absorbance measurements were made on shimadzu double beam spectrophotometer UV-140 with matched 1cm quartz cells and pH measurements were carried out using on Systronics pH meter 335.

Absorption spectra

The Absorption Spectrum of the colored species was scanned over the wave length region 400 – 650 nm against a reagent blank and the data is graphically represented (Fig.-2). The absorption curves show a maximum at 510nm against reagent blank.

Procedure

Aliquots of standard solutions (0.2 – 2.5 ml) were transferred into different 10 ml stoppered test tubes containing 6.0 ml of buffer and 1.0 ml of chloranilic acid solutions and made up to the mark with distilled water. After 5 min, the absorbance of developed purple-red color was measured at 510nm. The amount of rifampicin present in sample solution were computed from the standard curve.

For dosage forms

Sample powder equivalent to 50 mg of rifampicin was extracted with ethyl acetate. The residue from ethyl acetate extract was dissolved in methanol to produce a solution containing 200 µg/ml.

RESULTS AND DISCUSSION

The data given in Tables-2 and 3 suggest that the proposed method has reasonable precision and accuracy. The suitability of the method for analysis of pharmaceutical preparations was established by the data represented in Table-4. The proposed method was simple as it makes use of aqueous solutions, complete color development takes with in 2min and stable for considerable period.

Chemistry involved

Semi polar and polar solvent media facilitate the formation of radical ions and substitution usually at 2^{nd} or 5^{th} positions [15] Based on this fact the reaction of rifampicin with chloranilic acid at pH 7.0 may be formulated as given in Scheme-1.

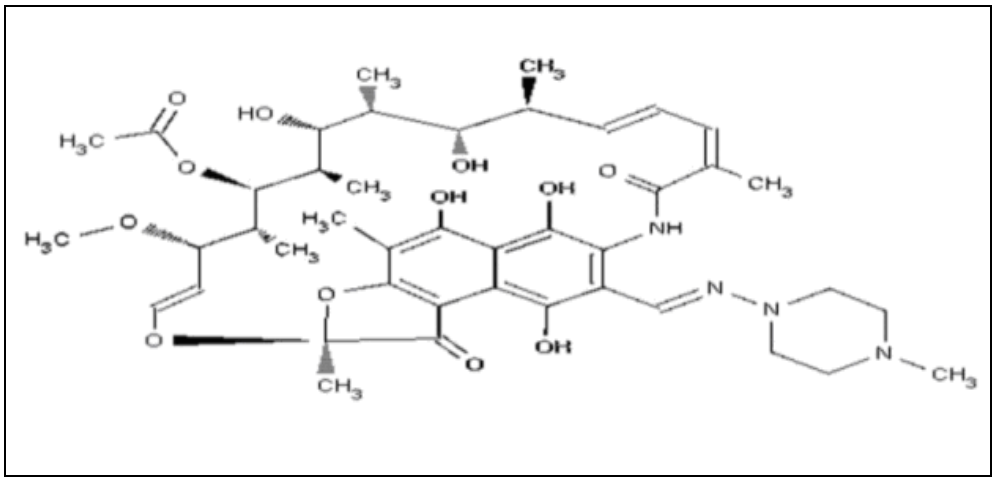


Fig.-1: Structure of Rifampicin

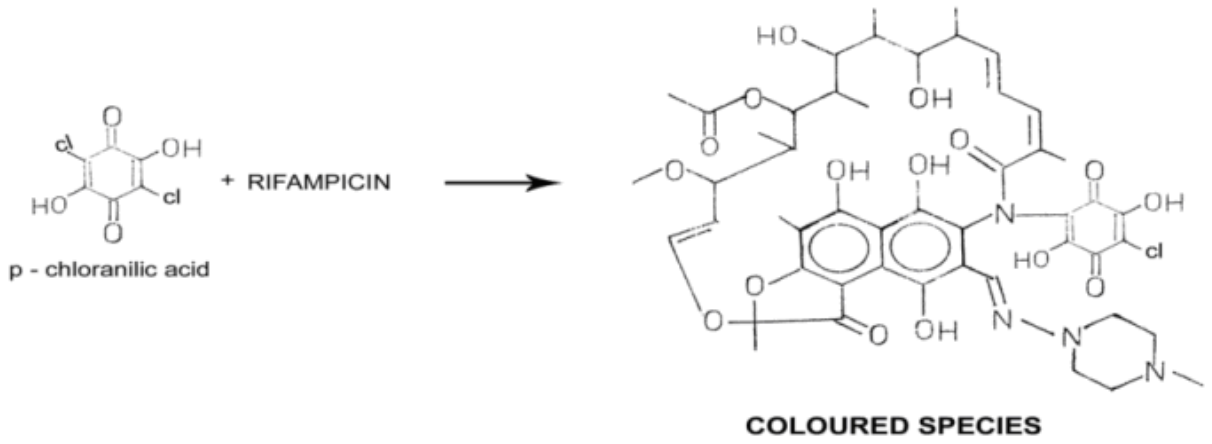
Table-1: Optical Characteristics

Concentration range (µg/ml) (C)	Regression equation	Correlation Co-efficient	Molar Absorptivity ($l.mole^{-1}.cm^{-1}$)	Sandell's sensitivity (µg / cm^2 / 0.001 absorbance unit)	Optimum photometric range (µg /ml)
5-50	A=0.0009+0.0119C	0.9999	$9.83 X10^3$	0.084	7.9-39.1

*Found in this work; It must be determined independently by users of the method.

Table-2: Precision of the Method

Antibiotic	% RSD	Percent range of error confidence limit	
		0.05 level	0.01 level
Rifampicin	1.90	± 2.00	± 2.72



Scheme-1

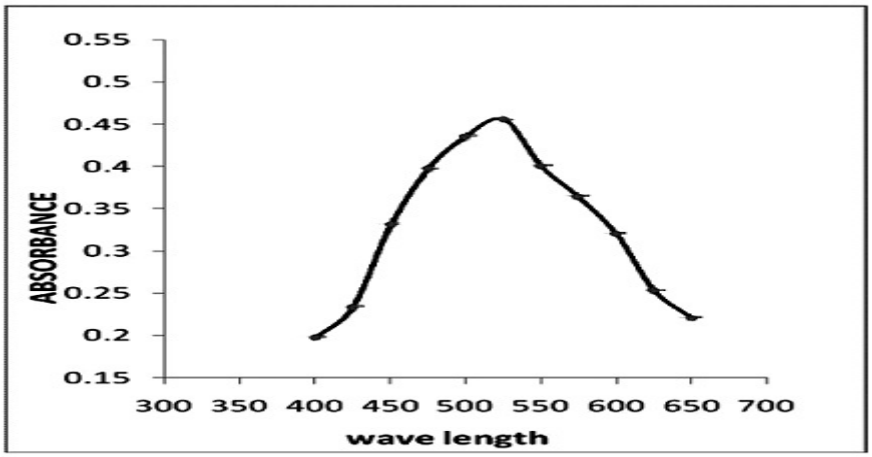


Fig.-2: Absorption Spectra of Rifampicin with Chloranilic Acid

Table-3: Accuracy of the Method

Antibiotic	Amount of antibiotic (µg)		
	Taken	Found	% error
Rifampicin	500	492.3	1.54

Table-4: Assay of formulations and % recovery data*

Sample	Labelled amount (mg)	Amount found (mg) in method		% Recovery* (proposed method)
		Proposed	Reported	
Rifampicin (Capsule)	150	148.0	147.2	98.66
(Tablet)	150	148.1	146.8	98.70

* Each result is an average of three determinations ** After adding 5 mg of drug.

CONCLUSION

The proposed method is simple, rapid and sensitive with reasonable precision and accuracy and it is useful for the determination of rifampicin in bulk samples, pharmaceutical preparations and biological fluids.

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