www.sphinxsai.com

International Journal of ChemTech Research
CODEN(USA): IJCRGG ISSN : 0974-4290
Vol.5, No.1, pp 42-46, Jan-Mar 2013

New Spectrophotometric Multicomponent Estimation of Ciprofloxacin and Tinidazole Tablets

B.PavaniPadmaPriya*

JNTUK, Vizianagaram campus,Vizianagaram- 535002,India.
***Corres.author: pavanipadmapriya@gmail.com**

Abstract: A simple, precise and sensitive procedure for simultaneous estimation of ciprofloxacin and tinidazole in two component tablets has been developed using 50% v/v glacial acetic acid. The absorbance maxima of ciprofloxacin and tinidazole are 281.7 nm and 310.9 nm respectively. Both the drugs obey Beer's Law in the concentration ranges employed for the proposed method. The results of analysis have been validated statistically and by the recovery studies. The method showed no interference by the compounds from each other when applied to formulation by means of UV-VIS spectroscopy and can be applied for routine simultaneous estimation of both drugs.

Keywords: spectrophotometric**, C**iprofloxacin, Tinidazole, Multicomponent tablets.

Introduction

Ciprofloxacin[1, 2] (1-cyclopropyl- 6-fluoro- 4-oxo- 7-piperazin- 1-yl- quinoline- 3-carboxylic acid) is a synthetic chemotherapeutic antibiotic of the fluoroquinolone class. It kills bacteria by interfering with the enzymes that cause DNA to rewind after being copied, which stops DNA and protein synthesis. Tinidazole[3, 4] (1-(2-ethylsulfonylethyl)-2-methyl-5-nitroimidazole) is an antitrichomonal agent effective against Trichomonas vaginalis, Entamoeba histolytica, and Giardia lambia infections. A literature survey revealed that very few spectrophotometric methods were available for analysis of Ciprofloxacin and Tinidazole in multicomponent tablets [5-7]. The authors now propose a simple, rapid, reproducible and economical method for simultaneous estimation of Ciprofloxacin and Tinidazole in tablet formulations using simultaneous equation method.

Experimental

Instrumentation: All spectral measurements were made on Elico UV-Visible spectrophotometer SL164 model.

Chemicals And Reagents

All the chemicals used were of analytical grade. All the solutions were freshly prepared. Following reagents and solutions were used.

1)50%v/v glacial acetic acid: Five hundred milliliters of glacial acetic acid is mixed with 500ml of distilled water, to give 1000ml solution of 50%v/v glacial acetic acid.

Preparations of standard and sample solutions:

About 100mg of Ciprofloxacin and Tinidazole were accurately weighed and separately dissolved in 100ml of the solvent to give 1000 µg/ml standard solutions. Several dilutions of these standard solutions in the concentration range of 100-900 µg/ml for Ciprofloxacin and 100-800 µg/ml for Tinidazole were prepared to get the respective sample solutions

Assay Procedure:

Aliquots of Ciprofloxacin and Tinidazole sample solutions were taken and scanned in the wavelength range of 250-350nm. Two wavelengths selected for the formation of simultaneous equations were 281.7 nm and 310.9 nm respectively. Similarly, mixed standard solutions were used and the drugs showed linearity in the concentration range of 100-

Figure 1: Typical Spectra of Ciprofloxacin And Tinidazole

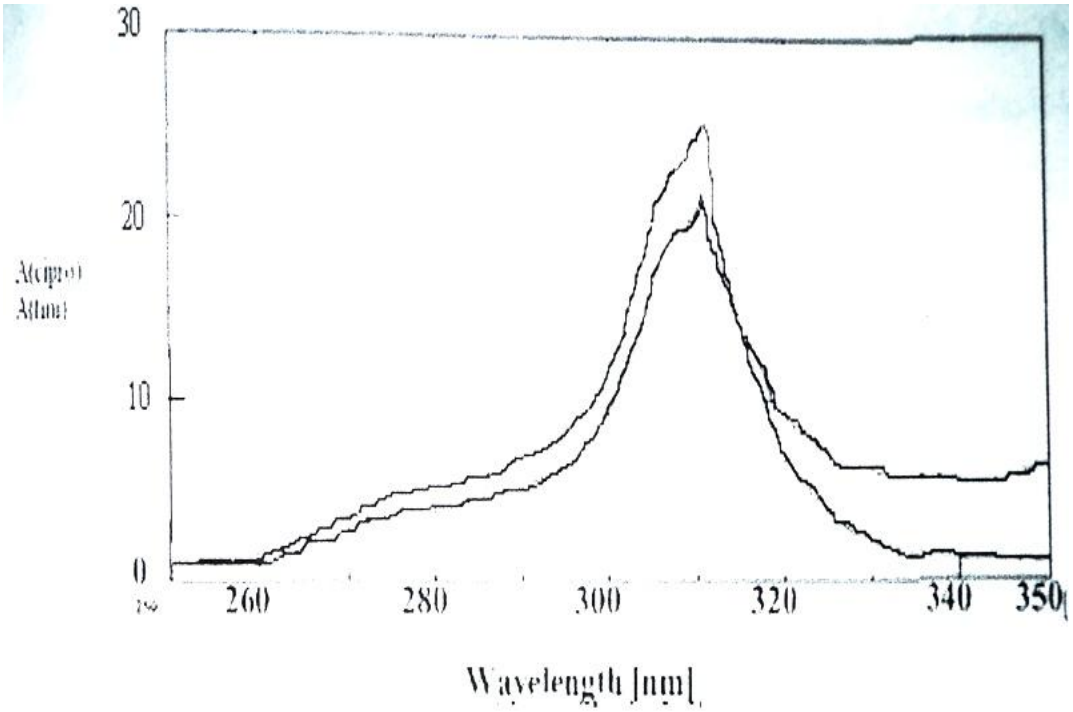


Table 1: Absorptivity values of Ciprofloxacin and Tinidazole

Concentration(µg/ml)		Absorptivity at 281.7nm		Absorptivity at 310.9nm	
Ciprofloxacin	**Tinidazole**	**Ciprofloxacin**	**Tinidazole**	**Ciprofloxacin**	**Tinidazole**
100	100	25.11	22.81	25.02	22.79
300	200	8.7	11.835	8.47	11.9
500	400	5.2	6.16	5.3	6.4
700	600	3.8	4.153	3.9	4.5
900	800	3.3	3.332	3.15	4.356
mean	mean	9.222	9.656	9.168	9.989

900 µg/ml for Ciprofloxacin and 100-800 µg/ml for Tinidazole against the reagent blank.

The method employs solving of simultaneous equations using Cramer's rule and matrices. The simultaneous equations formed were

$A1 = 9.222 \times C1 + 9.656 \times C2$……1

$A2 = 9.168 \times C1 + 9.989 \times C2$……2

Where A1 and A2 are absorbances of sample solution at 281.7 nm and 310.9 nm respectively.C1 and C2 are the concentrations of Ciprofloxacin and Tinidazole respectively in the sample solution. By substituting the value of C1 from equation 1 into equation 2, the value of C1 can be obtained. Similarly C2 can also be obtained.

Validation of proposed method:

Accuracy and Precision: The accuracy and precision of the methods were evaluated by performing six replicate analyses on pure drug solutions at three different concentration levels. The reproducibility of the methods was assessed by performing replicate analyses on pure drug solutions at three levels over a period of five days preparing all solution afresh each day.

Acceptance criteria: The relative error, an indicator of accuracy, intraday and inter day precision were found to be < 2.5%.

Table 2: Optical Characteristics and Precision

Parameters	Ciprofloxacin	Tinidazole
λ_{max} (nm)	281.7	310.9
Beer's law limits(µg/ml)(c)	100-900	100-800
Regression equation (Y*) Slope (b) Intercept (a) Correlation coefficient (r)	 7.1×10^{-2} 0.728×10^{-1} 0.9982	 3.17×10^{-2} 1.7705 0.9984
% RSD	0.3456	0.4237

*Y=bC+a, where C is the concentration of the drug (Ciprofloxacin or Tinidazole) in µg/ml and Y is the absorbance at the respective λ_{max} (nm).

Robustness: The stability indicating ability of the method was investigated by deliberately degrading the sample preparation. The stress conditions applied were acidic (0.1 M HCl), alkali (0.1 NaOH) and mild oxidising condition (3% H_2O_2) for 24 hr at 50°C.

Observation: Selected factors remained unaffected by small variations in these quantities.

Linearity: The linearity of the method was investigated by serially diluting the stock solutions of the drugs and measured values. The proposed method obeyed Beer's law at concentration range of 4-32 µg/ml.

Table 3: Linearity Data of Ciprofloxacin (281.7 nm)

CONCENTRATION	ABSORBANCE
4	1.857
8	2.012
12	2.124
16	2.271
20	2.401
24	2.528
28	2.658
32	2.772
CORRELATION	0.999105

Figure2: Linearity Graph

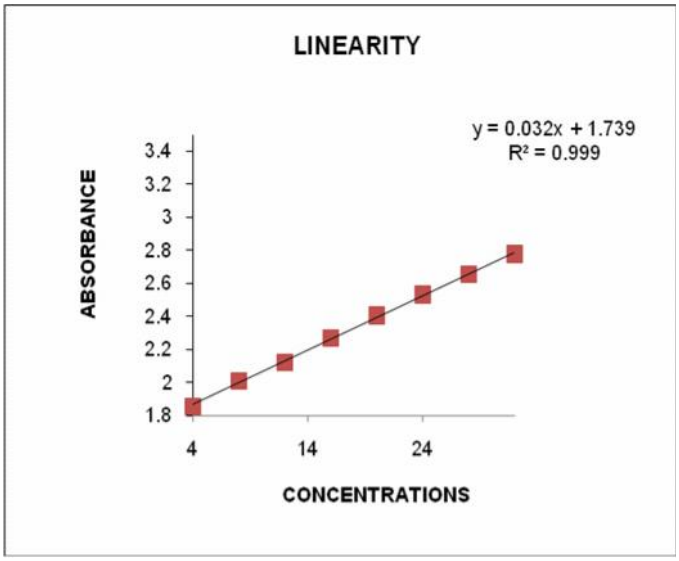
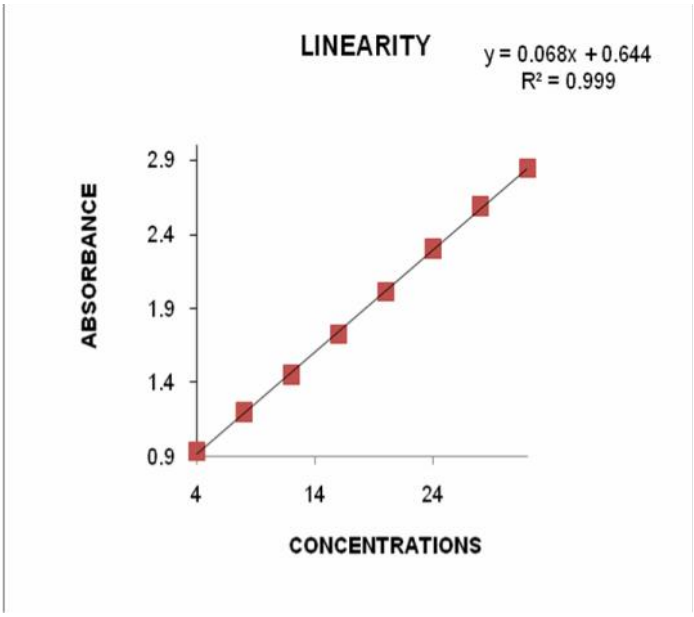


Table 4: Linearity Data of Tinidazole (310.9 nm)

CONCENTRATION	ABSORBANCE
4	0.941
8	1.198
12	1.451
16	1.729
20	2.018
24	2.301
28	2.584
32	2.851
CORELATION	0.999574

Figure3: Linearity Graph



Ruggedness: Ruggedness studies have been carried out for different parameters i.e. days and analysts. The results indicated that the selected factors remained unaffected by changes made.

Specificity and selectivity of the proposed method: The Specificity of the methodwas evaluated with regard to interference due to presence of excipients.The excipients used in different formulation products did not interfere with the absorption curves and thus, the method is specific for Ciprofloxacin and Tinidazole.

Assay Procedure for Tablet Formulation

Twenty tablets were weighed accurately. The average weight was determined and then ground to a fine powder. A quantity of powder equivalent to 250mg of Ciprofloxacin and 600mg of Tinidazole were transferred separately into different volumetric flasks. The solutions were filtered and further diluted with the solvent to give concentrations of 250µg/ml and 600 µg/ml respectively. The absorbances of these solutions were measured at 281.7 nm and 310.9 nm respectively as A1 and A2 and the concentrations of these two drugs in the samples were calculated using equation 1 and 2. Results of the analysis of the tablet formulation are reported in table 5.

Table 5: Determination of Ciprofloxacin and Tinidazole in combined tablet dosage form

Pharmaceutical dosage form	**Labeled Amount (mg)**		**Amount found by the Proposed methods (mg) (n=5)**		**Percentage Recovery of the proposed method (%)**	
	Ciprofloxacin	Tinidazole	Ciprofloxacin	Tinidazole	Ciprofloxacin	Tinidazole
T_1	500	600	500.012	600.001	100.002	100.001
T_2	500	600	499.999	600.005	99.999	100.000

T_1, T_2 are tablets from different manufacturers.

Results and Discussion

The aim of this study was to develop a simple, rapid, accurate and precise spectroscopic method for the analysis of ciprofloxacin and tinidazole in multicomponent tablet dosage forms. Fifty % v/v glacial acetic acid was used as the solvent. The optical characteristics such as Molar absorbtivities are shown in table 1. Beer's law limits and the regression characteristics like slope, intercept, correlation coefficient and percent relative standard deviation are shown in table 2. Commercial formulations of ciprofloxacin and tinidazole multicomponent tablet dosage forms were successfully analyzed by the proposed method and the results are presented in table5.

There was no interference of additives and excipients in the proposed analytical method.

The coefficient of variation was satisfactorily low with a recovery of 100% for both the drugs. The proposed method was found to be simple, accurate, economical and rapid. Hence, the recommended procedure can easily and conveniently be adopted for routine quality control analysis of ciprofloxacin and tinidazole multicomponent tablets.

Acknowledgement

The authors are thankful to Centaur Pharmaceuticals, Goa for providing reference samples of ciprofloxacin and tinidazole. The authors also express their gratitude to Head of the Department, Pharmaceutical analysis and Principal, JNTU College of Engineering, Kakinada, Vizianagaram for providing the facilities to carry out the present work.

References

1. www.wikipedia.com
2. James Swarbrick, James C. Boylan, Encyclopedia of pharmaceutical technology, Second edition, volume 3, p.2558
3. H. Salomies and J. P. Salo, Chromatographia, 36 (1993) 79−82
4. K. Rajnarayana, M. R. Chaluvadi, V. R. Alapati, S. R. Mada, G. Jayasagar and D. R. Krishna, Pharmazie. 57 (2002) 535−537.
5. M. Feng, H. Cao and F. Yu, Yaowu Fenxi Zazhi., 17 (1997) 247−249.
6. S M Khopkar, Basic Concepts of Analytical Chemistry, second edition, p.215.
7. S. M. Li, J. Chen, L. Fang, Y. J. Wu, Q. Q. Cheng and X. M. Wang, Zhongguo Yiyao Gongye Zazhi., 27 (1996) 216−218.

*****