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# Simultaneous Analysis of Tinidazole-Furazolidone Combination by UV-Spectrophotometry

A. SACHAN and P. TRIVEDI*
*Department of Pharmacy, S.G.S.I.T.S.*
*23, Park Road, Indore-452 003, India*

Two spectrophotometric methods have been developed for simultaneous analysis of tinidazole and furazolidone in two component suspension formulations. The methods are accurate, economical and allow direct measurement of the drugs without any prior separation. The absorbance maxima of tinidazole was found to be at 317 nm and that of furazolidone was at 367 nm, in 15% v/v N,N-dimethylformamide. The methods employ simultaneous equations and graphical absorbance ratio method for their simultaneous estimation. Both the drugs obey Beer's law in the concentration ranges employed for these methods. The methods have been validated statistically and by recovery studies.

## INTRODUCTION

Tinidazole is an antiprotozoal drug. IP[1] describes non-aqueous titrimetric assay procedure for the bulk drug and UV spectrophotometric assay procedure for tablet formulations. Other reported methods include spectrophotometric[2, 3], HPLC[4] and GLC[5] techniques for its determination in pharmaceutical preparations and biological fluids. Furazolidone is used as an antibacterial, antiprotozoal and antifungal drug. The IP[6], BP[7] and USP[8] suggest spectrophotometric method for the analysis of furazolidone. Few other methods like HPLC[9] and spectrophotometric[10] have also been reported for its determination in pharmaceutical dosage forms.

## EXPERIMENTAL

A Shimadzu UV/visible recording spectrophotometer (model: UV/160A) was employed with spectral band width of 2 nm, wavelength accuracy of ±0.5 nm (with automatic wavelength correction) and a pair of 10 nm matched quartz cells.

### Procedure

### Method-I: Employing Simultaneous Equations

The standard stock solution of strength 100 mcg/mL each of tinidazole and furazolidone was made in 15% v/v N,N-dimethylformamide separately.

From the overlain spectra (Fig. 1) of tinidazole (25 mcg/mL) and furazolidone (25 mcg/mL), two wavelengths selected for generation of simultaneous equations

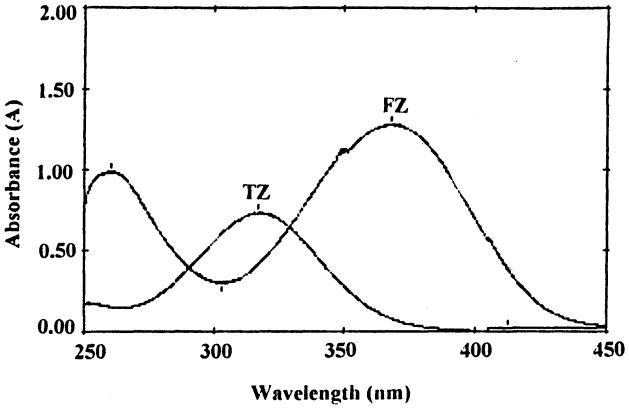


Fig. 1 Overlain spectra of tinidazole (TZ) and furazolidone (FZ).

are 317 nm and 367 nm. Molar absorptivity coefficient of both the drugs was determined at selected wavelengths. Molar absorptivity coefficients for tinidazole were found to be $7.201 \times 10^3$ and $0.811 \times 10^3$ at 317 nm and 367 nm respectively. The respective values for furazolidone are $4.945 \times 10^3$ and $15.124 \times 10^3$. These reported values are mean of three independent determinations. A set of two simultaneous equations framed using these molar absorptivity coefficient values are given below:

$$AA = (7.201C_1 + 4.945C_2) \times 10^3 \quad \text{(I)}$$

$$AB = (0.811C_1 + 15.124C_2) \times 10^3 \quad \text{(II)}$$

where AA and AB are absorbance of sample solution at 317 nm and 367 nm respectively. $C_1$ and $C_2$ are concentration of tinidazole and furazolidone respectively, in moles per litre, in the sample solution.

By substituting value of $C_1$ from eq. (I) into eq. (II), the value of $C_2$ can be obtained. Now substituting this value of $C_2$ in any of the first two equations the value of $C_1$ can be obtained.

**Preparation and Analysis of Suspension Sample Solution**

Accurately measured volume of suspension, equivalent to 100 mg of tinidazole and 35 mg of furazolidone was transferred to a 100 mL volumetric flask. It was diluted with 5 mL of distilled water. The suspension was dissolved in 75 mL of DMF by intermittent shaking for about 20 minutes and the volume was made up to 100 mL. The resultant solution (15 mL) was further diluted to 100 mL with distilled water. Aliquot of solution was diluted to get final concentration of 30 mcg/mL of tinidazole and 10.5 mcg/mL of furazolidone. Absorbances of the sample solution, *i.e.*, AA and AB, were measured at 317 nm and 367 nm respectively and concentrations of two drugs in sample were calculated using eq. (I) and eq. (II). The results of analysis of the suspension formulation of two different batches are stated in Table-1. The results of recovery studies conducted by addition of different amount of pure drugs(s) to a pre-analysed suspension solution were found to be satisfactory in the range of 99–102%.

TABLE-1
RESULTS OF ANALYSIS OF COMMERCIAL SUSPENSION FORMULATION

| Suspension | Batch-I | | Batch-II | |
|---|---|---|---|---|
| | TZ | FZ | TZ | FZ |
| Label claim (mg/5 mL) | 100 | 35 | 100 | 35 |
| Per cent estimated* | | | | |
| Method-I | 99.59 | 101.71 | 97.18 | 102.05 |
| Method-II | 98.66 | 100.62 | 98.54 | 99.36 |
| Standard Deviation | | | | |
| Method-I | 1.791 | 1.453 | 1.136 | 1.968 |
| Method-II | 1.342 | 1.790 | 0.954 | 2.173 |

*= Mean of three estimations, TZ = Tinidazole, FZ = Furazolidone

### Method II: Graphical Absorbance Ratio Method

Graphical absorbance ratio method uses the ratio of observed absorbance at two selected wavelengths, one of which is an "Isoabsoptive point" and other being the wavelength of minimum absorption of one of the two component. From the overlain spectra of two drugs (Fig. I) it is evident that tinidazole and furazolidone show isoabsorptive point at 326 nm. At 367 nm the absorbance of tinidazole is minimum. Therefore, the two wavelengths selected are 367 nm and 326 nm.

Six mixed standard drug solutions with tinidazole : furazolidone concentration (mcg/mL) in the ratio of 0 : 25, 10 : 20, 20 : 15, 30 : 10, 40 : 5 and 50 : 0 were prepared in 15% v/v DMF and the ratios of absorbances at the selected wavelengths from the spectra of mixed standard solutions were used to plot the calibration curves.

Suspension sample solution was made as described in Method I. The ratio of absorbances at 367 nm and 326 nm on the spectra of sample solution were measured and the amount of drugs present in the sample solution was calculated from the calibration curves plotted. The results of analysis using this method are given in Table-1. The recovery studies carried out gave satisfactory results in the range of 98–102%.

## RESULTS AND DISCUSSION

The proposed methods for analysis of tinidazole-furazolidone combination were found to be accurate, simple and rapid. The values of standard deviation are low and recovery was close to 100% indicating the accuracy and reproducibility of the methods.

The first method employing simultaneous equations is a very simple method and can be employed for routine analysis of these two drugs in combined dosage forms using the simplest instruments. Once the molar absorptivities are determined then it is just required to measure the absorbances of the sample solutions at the two selected wavelengths and few simple calculations.

The second method employs the absorbance ratio at two selected wavelengths. Once the absorbance ratio is determined it would only require determining the

concentration of the drugs from the calibration curves plotted. The method did not show any significant advantage over the first method except for eliminating the manual calculations required to solve the simultaneous equations.

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