of oedema has been described to be biphasic[9]. The initial phase is attributable to the release of histamine, serotonin, and kinin in the first hour after injection of carrageenan. A more pronounced second phase is related to the release of prostaglandin-like substances during the next 2-3 hours. The significant anti-inflammatory effect of oil of *C. martinii* leaves, may perhaps be due to inhibition of the prostaglandin pathway.

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Three simple spectrophotometric methods for the estimation of tinidazole and furazolidone in tablets

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Accepted 17 February 1998
Received 17 March 1997.

Three accurate and simple methods for the simultaneous estimation of tinidazole and furazolidone in tablet formulations have been developed. The methods employ first derivative spectrophotometry, simultaneous equations and the multicomponent mode of UV-160A Shimadzu spectrophotometer. Both the drugs obey Beer's law in the concentrations employed for these methods. The results of the analysis have been validated statistically and by recovery studies.

TINIDAZOLE, is an antiprotozoal drug belonging to the class of nitroimidazole derivative. The methods reported for the analysis are based on titrimetry[1], spectrophotometry[2], colorimetry[3], GLC[4], and HPLC[5,6]. Furazolidone, a nitofuran derivative, is an antibacterial drug. The methods reported are based on spectrophotometry[7-9], differential spectrophotometry[10], HPLC[11,12] and HPTLC[13]. Since only HPLC and HPTLC methods[14] have been reported for the simultaneous determination of the two drugs, in combined dosage form, this paper presents three simple, accurate, reproducible and economical methods for the simultaneous analysis of the two components in tablet formulations.

Shimadzu UV160A recording spectrophotometer was used for our experiments. Accurately weighed 100 mg of tinidazole and furazolidone were dissolved separately in N,N-dimethyl formamide and made upto 100 ml. From this stock solution, dilutions in 0.1 M hydrochloric acid were made to get concentrations of 6 - 30 µg/ml of tinidazole and 2 -1 0µg/ml of furazolidone respectively. Both the drugs obey the Beer's law in these concentration ranges employed as above, at 276.6 nm and 367 nm respectively.

Twenty tablets were weighed and ground to a fine powder. An accurately weighed quantity of powder equivalent to 300 mg tinidazole and 100 mg furazolidone was weighed

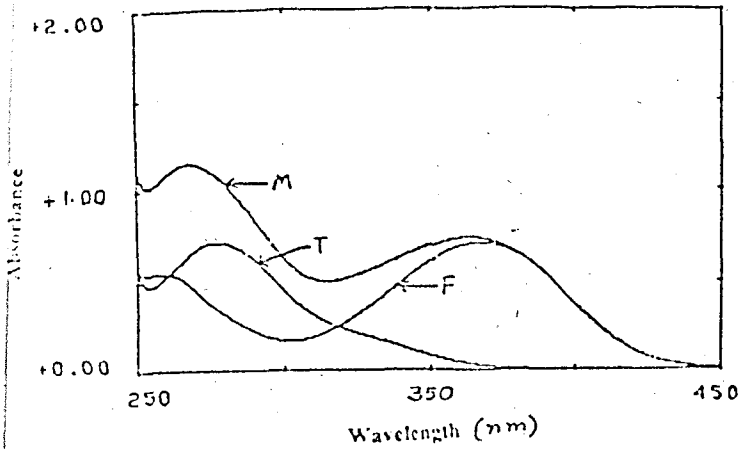

Fig.1: Absorption curve of tinidazole (T), furazolidone (F) and mixture of both drugs (M)

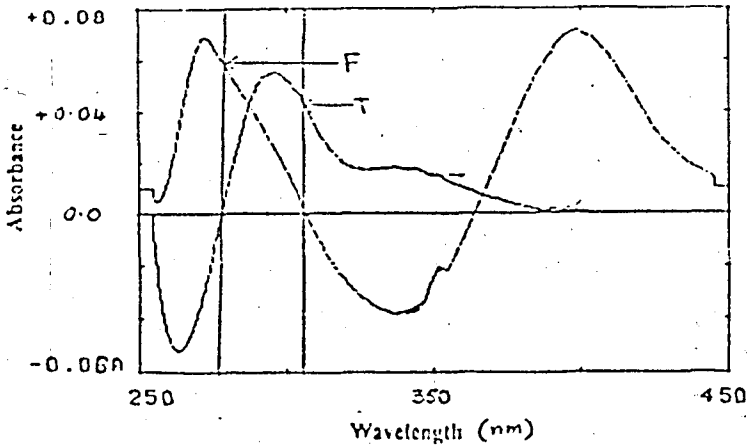

Fig.2: First derivative absorption curve for tinidazole (T) and furazolidone (F)

and dissolved in N,N - Dimethyl formamide, filtered through Whatman filter paper. The volume of the filterate was finally made upto 100 ml. This solution was suitably diluted in 0.1 M hydrochloric acid to get a concentration of 30 µg/ml to tinidazole and 10 µg/ml of furazolidone. The absorbance of this solution was found to be additive at 276.6 nm and 367 nm as shown in the spectra (Fig. 1).

The molar absorptivity of the two drugs at 276.6 nm and 367 nm were determined. The molar absorptivities for tinidazole are 380.4 (a_1) and 35.38 (a_2) at the above wavelengths respectively. For furazolidone, the respective values are 291.1 (b_1) and 680.25 (b_2). The concentration of the individual components in the tablet formulation was obtained by employing the simultaneous equation.

$$\text{Concentration of tinidazole (\%w/v)} = 100\left\{\frac{b_1S_2 - b_2S_1}{b_1a_2 - b_2a_1}\right\}$$

$$\text{Concentration of furazolidone (\%w/v)} = 100\left\{\frac{a_1S_2 - a_2S_1}{a_1b_2 - a_2b_1}\right\}$$

Where 'a_1' and 'a_2' are the molar absorptivities of tinidazole at 276.6 nm and 367 nm respectively.

'b_1' and 'b_2' are the molar absorptivities of furazolidone at 276.6 nm and 367 nm respectively.

'S_1' and 'S_2' the absorption of the mixture at 276.6 nm and 367 nm.

The results of analysis of the tablet formulations are stated in Table 1.

From the stock solution, dilutions with 0.1 M hydrochloric acid were done to get 30 µg/ml tinidazole and 10 µg/ml furazolidone. First derivative spectra of the two drugs were recorded (fig 2) and it was seen that tinidazole and furazolidone showed zero absorbance at 277.6 nm and 303 nm respectively. As at the zero crossing point on the first derivative spectra of one drug, the other drug showed substantial absorbance, these two wavelengths were employed for the estimation of tinidazole and furazolidone respectively without any interference.

Tablet sample solutions were made as mentioned in Method I. First derivative spectra of the sample solution was recorded to measure the absorbance at the above two wavelengths and the amount of drug present in the sample solutions was obtained from the calibration curves plotted. The results of analysis using this method are given in Table 1.

Six mixed standard solutions with different concentrations ranging from 0, 6, 12, 18, 24 and 30 µg/ml of tinidazole and 10, 8, 6, 4, 2 and 0 µg/ml of furazolidone respectively were prepared in 0.1 M hydrochloride acid. All the mixed standard solutions were scanned over the range of 450 nm to 250 nm in the multicomponent mode using two sample points of 367 nm and 277 nm. The spectral data from these scans were used to determine the concentration of the two drugs in the tablet sample solutions. Tablet sample solutions were made as mentioned in Method I. This sample was scanned as above and the concentration of each component was obtained from the spectral data of the six standards. The results of analysis are given in Table 1. The recovery of the added standard was studied for each

Table 1 : Analysis of formulations of tinidazole and furazolidone and recovery studies.

Tablets	Label claim mg/tab	Amount found (mg/tablet) Mean ± S.D*			% Label claim Mean ± S.D*			% Recovery Mean ± S.D*		
		Method I	Method II	Method III	Method I	Method II	Method III	Method I	Method II	Method III
Tinidazole	300	303.8 ± 5.85	304.0 ± 5.4	299.0 ± 1.05	101.3 ± 1.95	101.3 ± 1.80	99.7 ± 0.35	99.5 ± 0.84	100.1 ± 1.59	100.3 ± 0.12
Furazolidone	100	100.9 ± 1.61	102.3 ± 1.84	99.4 ± 0.59	100.9 ± 1.61	102.3 ± 1.84	99.4 ± 0.59	101.9 ± 3.3	101.1 ± 1.28	100.3 ± 0.17

* Mean of 5 observations

Method I – Employing simultaneous equations
Method II – Derivative spectrophotometric method
Method III – Multicomponent mode of UV 160A spectrophotometer.

method and the results are presented in Table 1.

The first method employing simultaneous equations is a very simple method and can be employed for routine analysis. As the molar absorptivities are determined very less time will be required for analysis as it would only require determination of the absorbances of the sample solutions at the two selected wavelengths and simple calculations. The second method requires spectral data processing and hence can be applied only on a recording spectrophotometer with such facilities like the one used for this work. This method also gave good results. The third method is specific for this instrument. It employs a programme for the simultaneous quantification of upto eight compounds from their mixtures. The instrument used for this analysis can store only one set of multi-component mode data and so every time a different sample is to be analysed, a fresh set of standard solutions have to be scanned. The method requires no manual calculations.

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