

Simultaneous Spectrophotometric Determination of Etoricoxib and Paracetamol in a Laboratory Mixture

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ABSTRACT: An accurate, specific and precise UV spectrophotometric method was developed for the simultaneous determination of etoricoxib (ET) and paracetamol (PCM) in a laboratory mixture of these two components. The method involves formation of simultaneous equation at 283.5 and 248 nm, using methanol as a solvent. The linearity for both etoricoxib and paracetamol was in the range of 2-20 µg/ml and 1-10 µg/ml respectively. The % recovery was found to be 98.23% and 98.87% for etoricoxib and paracetamol respectively indicating proposed method is accurate and precise for simultaneous estimation of etoricoxib and paracetamol in bulk formulations.

KEY-WORDS: Etoricoxib, Paracetamol, Simultaneous equation, UV spectrophotometry.

INTRODUCTION

Etoricoxib (ET) (5-chloro-2-[6-methyl pyridin-3-yl]-3-[4-methylsulfonylphenyl] pyridine) is a novel, selective second generation cyclooxygenase-2 inhibitor administered orally as an analgesic and anti-inflammatory drug^{1,2}. Paracetamol (PCM) is a 4-hydroxy acetanilide having analgesic and antipyretic activity³. The literature reports many analytical methods for the quantitative determination of ET and PCM alone or in combination with other drugs including spectroscopic^{4,5-8}, chromatographic methods⁹⁻¹⁵, solid phase extraction¹⁶ and mass fragmentography¹⁷. However, there is no evidence in literature for simultaneous determination of ET and PCM. Hence, in the present investigation simultaneous equation method was developed for the determination of ET and PCM in combination from their laboratory mixture.

MATERIALS AND METHODS

Materials

Etoricoxib and paracetamol were supplied by Unichem Ltd., and Ajanta Pharma Mumbai, respectively as gift samples. A Shimadzu 1700 UV spectrophotometer with

1 cm matched quartz cells was used for estimation. All reagents were used of AR grade purchased from Loba chemie, Mumbai.

Methods

Standard Preparation

Accurately weighed quantities (5 mg each) of ET and PCM were dissolved separately in sufficient quantity of methanol in a 50 ml volumetric flask. The volume was adjusted up to the mark with methanol to obtain a stock solution of 100 µg/ml; each of ET and PCM.

Preparation of laboratory mixture

A bulk mixture of both drugs (ET and PCM) was prepared using 120 mg of ET and 250 mg of PCM. Common excipients which are used in tablet formulation were added in this laboratory mixture, triturated well and weighed. A powder equivalent to 3.84 mg of ET and 8 mg of PCM was weighed accurately and transferred to 100 ml of volumetric flask, dissolved in sufficient quantity of methanol and volume was adjusted up to the mark with methanol. The sample solution thus prepared was filtered through

Whatman filter paper no. 41, diluted with methanol to get the solution containing about 3.84 µg/ml of ET and 8 µg/ml of PCM.

Method development

For the selection of analytical wavelength for the simultaneous equation method, the stock solutions of ET and PCM were separately diluted with methanol, to obtain the concentrations of 10 µg/ml each, and scanned in the wavelength range of 200-400 nm. The λ_{\max} of ET and PCM were found to be 283.5 nm (λ_1) and 248.5 nm (λ_2) respectively. For the construction of calibration curve, standard solutions of ET and PCM were diluted in the range of 2-20 µg/ml and 1-10 µg/ml respectively. The absorbances were recorded at 283.5 nm (λ_1) and 248.5 nm (λ_2) and absorptivity values of ET (ax_1 and ax_2) and PCM (ay_1 and ay_2) were calculated. Where,

ax_1 = absorptivity of ET at λ_1

ay_1 = absorptivity of PCM at λ_1

ax_2 = absorptivity of ET at λ_2

ay_2 = absorptivity of PCM at λ_2 .

Analysis of laboratory mixtures and recovery studies

As described earlier, the solutions of appropriate concentrations of laboratory mixture prepared were analysed using simultaneous equation constructed as follows:

$$A_1 = ax_1C_{ET} + ay_1C_{PCM} \quad (1),$$

$$A_2 = ax_2C_{ET} + ay_2C_{PCM} \quad (2),$$

Where, A_1 and A_2 are the absorbances of sample solutions at λ_1 and λ_2 respectively and

C_{ET} and C_{PCM} are the concentrations of ET and PCM respectively.

Recovery studies were carried out at 80%, 100% and 120% level by adding a known quantity of pure drug to the preanalyzed laboratory mixture and the proposed method was followed. From the amount of drug found, percentage recovery was calculated.

RESULTS AND DISCUSSION

The proposed method of simultaneous determination of ET and PCM showed molar absorptivity of 1.6745×10^4 l/mol/cm and Sandell's sensitivity 0.02143 mcg/Sq.cm/0.001-absorbance units for ET whereas PCM showed molar absorptivity of 1.4199×10^4 l/mol/cm and Sandell's sensitivity 0.02143 mcg/Sq.cm/0.001-absorbance units. Linear regression of absorbance on concentration gave equation $y = 0.046664x + 0.0106$ with a correlation coefficient of 0.9988 and $y = 0.09403x + 0.00833$ with a correlation coefficient of 0.9988 for ET and PCM respectively. The low % RSD values of 0.4255 for ET and 0.4168 for PCM were observed for analysis of 3 replicate samples, indicating precision and reproducibility. ET exhibits its maximum absorption at 283.5 nm and obeyed Beer's law in the range of 2-20 µg/ml and PCM exhibits its maximum absorption at 248.5 nm and obeyed Beer's law in the range of 1-10 µg/ml. The results of analysis and recovery studies are presented in the Table 1. The percentage recovery value 98.23% and 98.87% for ET and PCM respectively indicates that there is no interference from the excipients present in laboratory mixture. The developed method was found to be sensitive, accurate, precise and reproducible and can be applicable for the analysis of ET and PCM in laboratory mixtures.

TABLE 1. ANALYSIS OF DOSAGE FORMS AND RECOVERY STUDIES.

Product	Drug	Label claim	% Estimated *	% RSD	% Recovery [†]	% RSD of recovery
Lab	ET	120 mg	100.97	0.41	98.23	1.23
Mixture	PCM	250 mg	102.01	1.11	98.87	1.34

ET: Etoricoxib; PCM: Paracetamol; * Indicates mean of three determinations (n=3); RSD: Relative standard deviation; [†] Indicates mean of three recovery studies at 80%, 100% and 120% level.

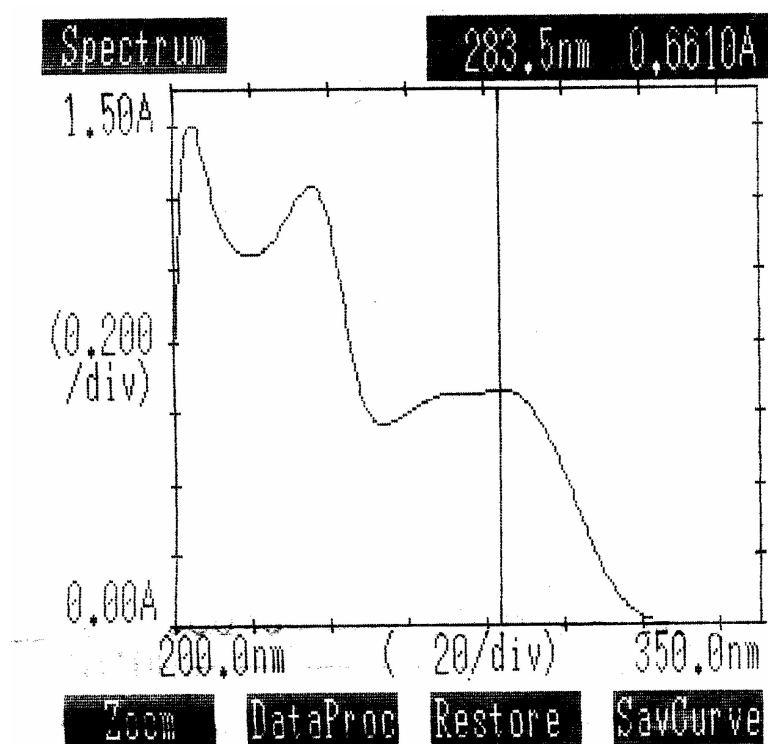
FIGURE 1a. λ_{\max} of etoricoxib (ET) in methanol

Fig. 1a

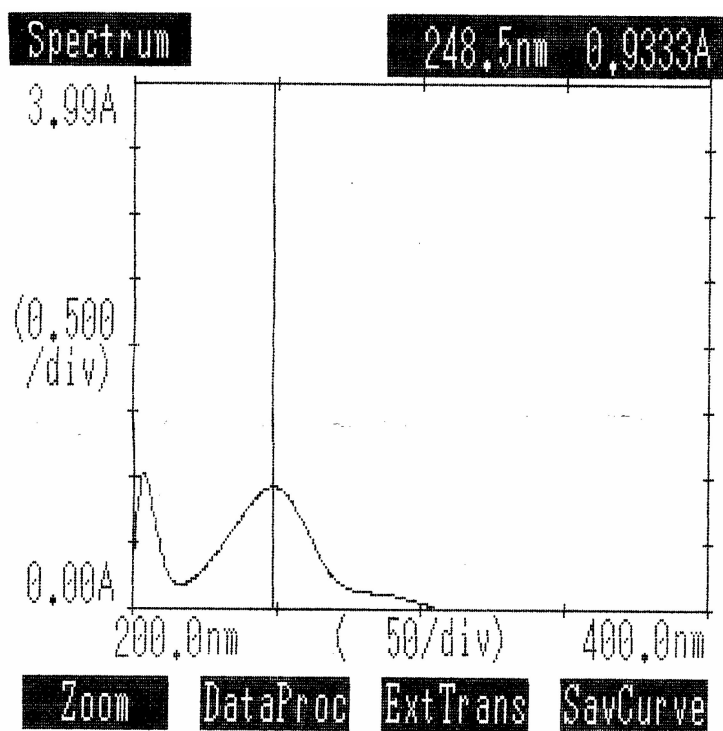
FIGURE 1b. λ_{\max} of paracetamol (PCM) in methanol.

Fig. 1b

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