RESEARCH ARTICLE

New Spectrophotometric Methods for the Assay of Etoricoxib

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Abstract

Introduction: Etoricoxib is an anti-inflammatory drug. New derivative spectrophotometric methods have been developed for the assay of Etoricoxib in tablets. **Materials and Methods:** The present study was performed in three different reagents - sodium acetate buffer, hydrochloric acid, and phosphate buffer using Shimadzu double beam ultraviolet (UV)-VIS spectrophotometer UV-1800 model. **Results and Discussion**: Etoricoxib has obeyed Beer–Lambert's law in all the three reagents, and the methods were validated. **Conclusions:** The methods are economical and used for the assay of Etoricoxib in pharmaceutical dosage forms.

Key words: Etoricoxib, derivative spectroscopy (D_1), validation

INTRODUCTION

Etoricoxib [Figure 1] is a new anti-inflammatory drug[1] used for pain and inflammation. Very few spectrophotometric methods[2-5] have been established for the determination of Etoricoxib, and in the present study, the authors have developed zero-order and derivative spectrophotometric methods for the quantitative analysis of tablets, and the method was validated.[6]

MATERIALS AND METHODS

Etoricoxib is available with brand name KRETOS (Glenmark Pharmaceuticals) (Label claim: 90 mg; 120 mg) and NUKOXIA (Zydus Cadila Healthcare Ltd.) (Label claim: 60 mg; 90 mg) etc., in India., model no. Ultraviolet (UV)-1800 double beam UV-VIS spectrophotometer (Shimadzu) was used for the study. Sodium acetate (pH 4), hydrochloric acid (0.1 N), and phosphate buffer pH 7.0 were prepared (IP 1996). Etoricoxib stock solution was prepared by dissolving 25 mg of Etoricoxib in 25 ml volumetric flask with methanol.

Method Validation

Zero-order spectroscopy (D_0) and first-order derivative spectroscopy (D_1)

Etoricoxib solutions were prepared from the stock with sodium acetate buffer pH 4.0 (Method I) and phosphate buffer pH 7.0 (Method II) and scanned against their reagent blank. The zero-order spectrum (D_0) obtained has shown λ_{max} at 225.6 and 234.4 nm in Method I and Method II. Calibration curves were drawn by taking the concentration on the X-axis and the corresponding absorbance on the Y-axis. The individual zero-order absorption spectra obtained in three reagents - hydrochloric acid (Method I), sodium acetate buffer (Method II), and phosphate buffer (Method III) were converted into first-order derivative spectra (D_1) with the inbuilt software of the instrument, and the amplitude was calculated. Calibration curves were drawn by taking the concentration on the X-axis and the corresponding derivative

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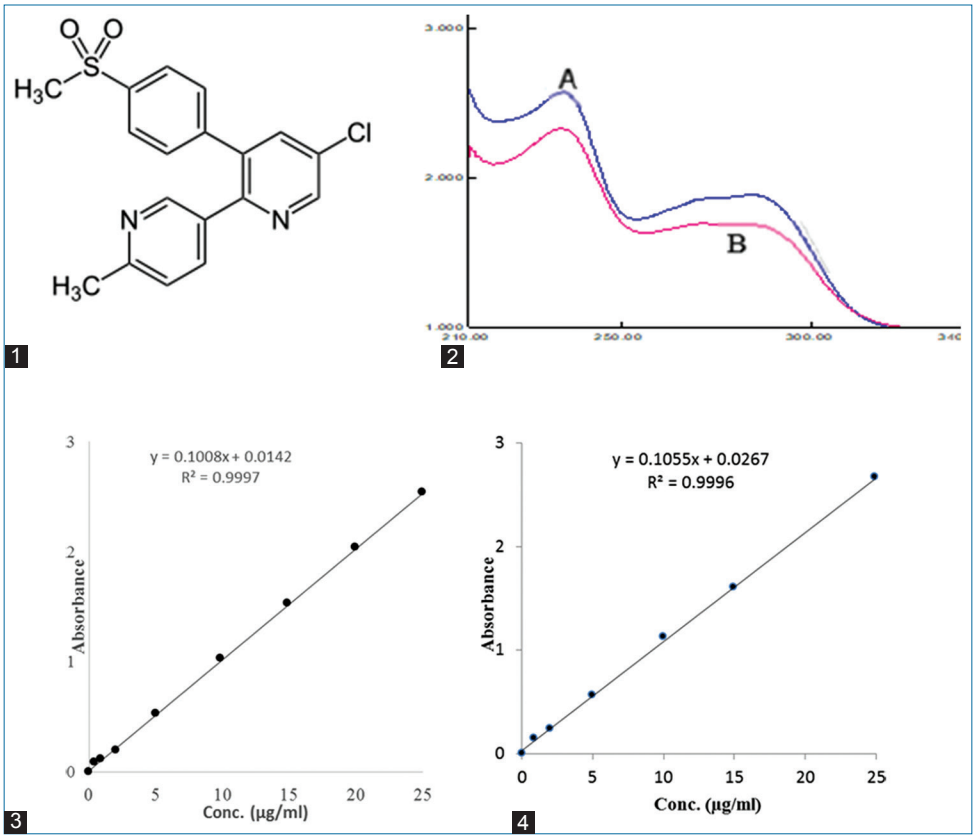

Figure 1: (1) Chemical structure of Etoricoxib (2) absorption spectrum of Etoricoxib (a) phosphate buffer (20 µg/ml) (b) sodium acetate buffer (10 µg/ml) and calibration curves of Etoricoxib in (3) phosphate buffer (4) sodium acetate buffer

Table 1: Comparison of the present method with the published methods in literature

Reagents	λ_{max} (nm)	Linearity (µg/mL)	Reference
HCl	233	0.1-0.5	[2]
HCl	223.3	2-24	[3]
Chloroform	247	1-40	[4]
Hydrochloric acid Sodium acetate buffer Phosphate buffer	234 225.6 234.4	0.5–25 (Method I) 1–20 (Method II) 1–25 (Method III)	Present method (D_1 and D_0)

absorbance on the Y-axis. Precision and accuracy studies were estimated by taking % relative standard deviation values into consideration by the standard procedures.

Assay of Etoricoxib tablets

Twenty Etoricoxib tablets were procured and powdered. Powder equivalent to 25 mg of Etoricoxib was taken and extracted with methanol followed by dilutions with hydrochloric acid, sodium acetate buffer, and phosphate buffers for all the methods, and the assay was carried out as per the procedure explained above.

RESULTS AND DISCUSSION

Zero-order (D_0) (sodium acetate buffer and phosphate buffers) and first-order derivative spectroscopy (D_1) (hydrochloric acid, sodium acetate buffer, and phosphate buffers) have been developed for the determination of Etoricoxib tablets. The present proposed method was compared with the previously published methods in Table 1. The overlay absorption spectrum (D_0) in sodium acetate buffer and phosphate buffers for Methods I and II is shown in Figure 1 (A and B). Etoricoxib obeys Beer–Lambert's law [Table 2], and the linear regression equations were calculated in sodium acetate buffer (y = 0.1055x + 0.0267) and phosphate buffer (y = 0.1008x + 0.0142), respectively [Figure 1]. The methods are precise and accurate.

In first-order derivative spectroscopy (D_1), the overlay first-order derivative spectra of Etoricoxib in phosphate buffer, hydrochloric acid, and sodium acetate buffer for Methods I, II and III respectively are shown in Figure 2 and the spectral characteristics observed were shown in Table 3. As the derivative spectra have shown, both minima and maxima

Table 2: Optical characteristics of Etoricoxib (zero-order spectroscopy)

Parameters	Method I	Method II
Linearity range (μg/ml)	1–25	1–25
λ_{max} (nm)	225.60	234.4
Molar extinction coefficient (L/mole/cm)	6.05×10^4	3.617×10^4
Sandell's sensitivity (μg/cm²/0.001absorbance unit)	0.3238	0.1170
Slope	0.1055	0.1008
Intercept	0.0267	0.0142
Correlation coefficient	0.9997	0.9996
Precision (%RSD)	0.281	0.246
Accuracy (%RSD)	0.815	0.864

%RSD: % relative standard deviation

Table 3: Linearity of Etoricoxib in first derivative spectroscopy

Concentration (μg/ml)	Method I phosphate buffer			Method II hydrochloric acid			Method III sodium acetate		
	Maxima	Minima	Amplitude	Minima	Maxima	Amplitude	Maxima	Minima	Amplitude
0.1	-	-	-	-	-	-	-	-	-
0.5	0.000	0.001	0.001	0.001	0.003	0.004	-	-	-
1	0.000	0.001	0.001	0.003	0.006	0.009	0.001	0.002	0.003
2	0.001	0.001	0.002	0.007	0.009	0.016	0.002	0.004	0.006
5	0.001	0.004	0.005	0.01	0.03	0.04	0.006	0.009	0.015
10	0.009	0.002	0.011	0.02	0.06	0.08	0.019	0.014	0.033
15	0.010	0.006	0.016	0.09	0.03	0.12	0.032	0.017	0.049
20	0.015	0.007	0.022	0.11	0.05	0.16	0.034	0.048	0.082
25	0.018	0.009	0.027	0.137	0.061	0.198	-	-	-

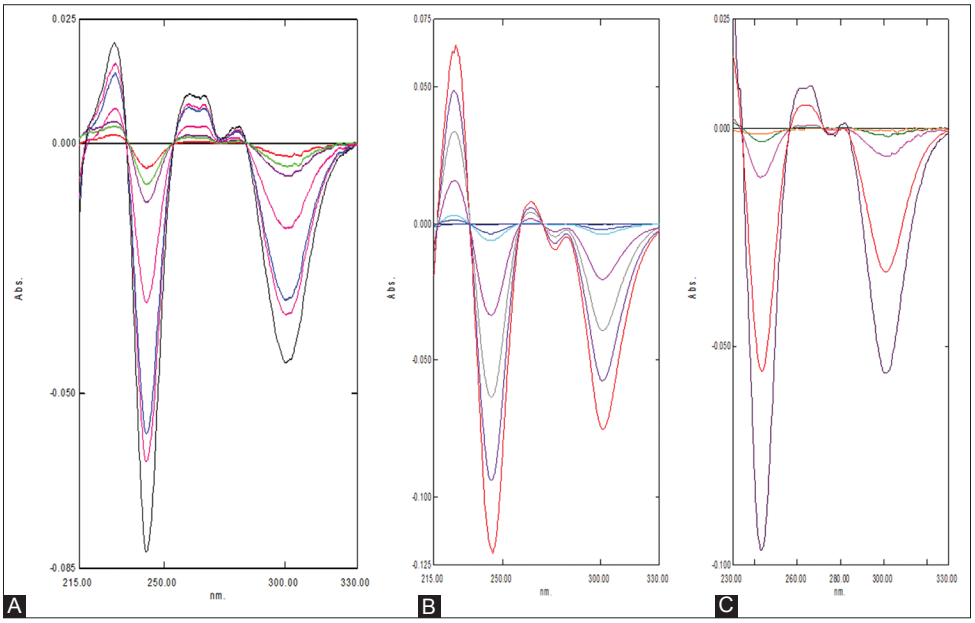

Figure 2: Overlay first derivative spectrum (D_1) of Etoricoxib in (a) phosphate buffer (b) hydrochloric acid (c) sodium acetate buffer

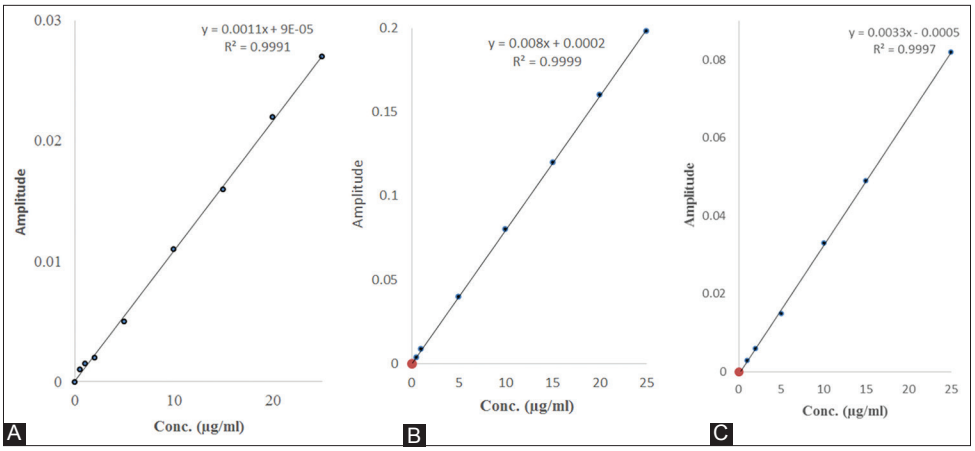

Figure 3: Calibration curves of Etoricoxib (D1) (a) phosphate buffer (b) hydrochloric acid (c) sodium acetate buffer

calculations were done using amplitude against concentration for the construction of calibration curves [Figure 3].

CONCLUSION

The spectrophotometric techniques were validated and found to be simple and economical for the analysis of Etoricoxib tablets.

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