Simultaneous Estimation of Ibuprofen and Famotidine in Raw Materials and in Tablet Dosage Form

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Abstract-This paper describes two simple methods for the determination of Simultaneous spectrophotometric determination of Ibuprofen and Famotidine by the area under the curve and derivative method . Method I, 227.5nm - 220 nm and 294 nm – 282 nm, Method II 209.5 nm – 248 nm were selected in the zero order for 1st method and in the 1storder for 2nd method of Ibuprofen and Famotidine respectively. Linearity range for both methods were 15 – 75 mcgmL-1 for Ibuprofen and 0.5 – 2.5 mcgmL-1 for Famotidine. The methods were validated statistically and recovery studies were carried out to confirm the accuracy. Both proposed methods were successfully applied to the determination of Ibuprofen and Famotidine in raw material and in tablet dosage form.

Keywords : Ibuprofen (IB) and Famotidine (FA)

INTRODUCTION

Ibuprofen is chemically (RS) – 2 – (4-(2- methyl propyl) Phenyl) propanoic acid[1]. It is a nonsteroidal anti – inflammatory drug (NSAID) used for relief of symptoms' of arthritis, fever and analgesic (pain reliever) especially where there is an inflammatory component and dysmenorrhea.

Famotidine is chemically 3 – [[[2-(Diaminomethylen] amino] thiazol – 4 – yl] methyl] sulphanyl N – sulphamoyl propanimidamide[1]. It is a histamine H_2 – receptor antagonist that inhibits stomach acid production, and it is commonly used in the treatment of peptic ulcer diseases and gastroesophageal reflux disease. Combination of IB and FA is anti-inflammatory and reduce the risk of ulcer.

Literature survey reveals that UV (1-9), HPLC (10-13), GC (14) methods are reported for the determination of IB and FA individually and combination with some other drugs. There are no reported RP-HPLC methods for simultaneous estimation of both drugs in combined dosage form.

MATERIALS

Ibuprofen and Famotidine was supplied byMedopharm Pvt. Ltd., Guduvancheery.

SOLVENTS

Methanol (Analytical Grade)

METHOD I : AREA UNDER THE CURVE METHOD

This method is based on the area under the curve and simultaneous equation. Using appropriate dilutions of standard stock solutions, two solutions were scanned separately in the range from 200 – 400 nm. From the overlain spectra of IB and FA, area was measured at wavelengths 227.5 – 220 nm and 294 – 282 nm for the determination of IB and FA respectively. The area of mixed standard was measured at selected wavelengths. The absorptivities (ax1, ax2, ay1, ay2) were calculated by dividing area by concentration in g/Lit. The concentration of each component was calculated using following equations:

$C_{IB} = (A_1ax_2 – A_2ax_1) / (ax_2ay_1 – ax_1ay_2)$

$C_{FA} = (A_2ay_1 – A_1ay_2) / (ax_2ay_1 – ax_1ay_2)$

Where A_1 = Area of sample of 227.5 – 220

A_2 = Area of sample at 294 – 282

ax_1 = Absorptivity of FA at 227.5 – 220

ay_1 = Absorptivity of FAat 294 – 282

ax_2 = Absorptivity of IB at 227.5 – 220

ay_2 = Absorptivity of IB at 294 – 282

METHOD II : DERIVATIVE SPECTROPHOTOMETRIC METHOD

Using appropriate dilutions of standard stock solutions, two solutions were scanned separately in the range of 400 nm – 200 nm. First derivative spectra of both solutions were obtained. From overlain first derivative spectra, IB was determined at 209.5 nm (where FA shows no interference) and FA was determined at 248 nm (where IB shows no interference). The concentration of individual drug was determined against calibration curve.

STOCK SOLUTIONS

The stock solution of 1mg/mL of each of IB and FA were prepared in methanol. Further dilutions were prepared in methanol.

ANALYSIS OF TABLET FORMULATION

Twenty tablets were weighed accurately and crushed to fine powder. The powder equivalent to 300 mg of IB and 10 mg of FA was transferred to 25 mL volumetric flask. The powder was dissolved in 10 mL of methanol by intermittent shaking and volume was made up to 25 mL with the same solvent. The solution was then filtered through a Whatmann filter paper no.41. The resultant solution was diluted to 30 mcg/mL of IB and 1 mcg/mL of FA by methanol.

The concentration of both IB and FA were determined by measuring the absorbances of samples at 227.5 – 220 nm and 294 – 282 nm for area under the curve method and at 209.5 nm and 248 nm (in first derivative mode) for derivative spectrophotometric method and substituting it in respective equations.

METHOD VALIDATION

Linearity of the method was studied by plotting calibration curves. From each of the stock solutions suitable aliquots were diluted to get concentrations in the range of 15 – 75 mcg/mL for IB and 0.5 – 2.5 mcg/mL for FA. Both sides of solutions were scanned in the range of 400 nm – 200 nm. Absorbances were measured at 227.5 – 220 nm and at 294 -282 nm for IB and FA respectively for area under the curve method. Then in the first derivative mode, absorbances of the same solutions were measured at 209.5 nm for IB and 248 nm for FA for derivative spectroscopy method. Calibration curves were obtained by plotting absorbance against concentration.

Precision of the method was studied by replicate determinations, intraday study and interday study on an accurately weighed and finely crushed tablets.

To ascertain the accuracy of proposed methods, recovery studies were carried out by standard addition method at three different levels (80 %, 100 % and 120 %) within the range of linearity for both the drugs.

RESULTS AND DISCUSSION

Under the experimental conditions described above calibration curve, precision studies, assay of tablets and recovery studies were performed. Both drugs obeyed Beer's law within concentration range of 15 – 75 mcg/mL for IB and 0.5 – 2.5 mcg/mL for FA with correlation coefficient > 0.999. The proposed methods were also evaluated by the assay (n = 3) of tablets containing IB and FA. The results of assay are presented in Table I.

To ascertain the accuracy of proposed methods, recovery studies were carried out by standard addition method at three different levels (80%, 100% and 120%). Percent recovery for IB and FA was in the range of 99.29%– 101.13% by area under the curve method and was in the range of 99.00 % - 101.87% by derivative spectroscopic method. The accuracy and reproducibility is evident from the data as results are close to 100% and low standard deviation value. Results of recovery studies are shown in Table I.

The reproducibility of the proposed method was determined by intra – day and inter – day checked and six replicate determinations. For both IB and FA % RSD was less than 2.

CONCLUSION

The proposed spectroscopic methods are simple rapid, accurate and precise for the simultaneous estimation of drugs in respective two – component oral dosage forms of IB and FA. The developed methods can be used for routine quantitative simultaneous estimation of IB and FA in pharmaceutical preparations.

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Table I: Validation parameters for IB and FA for method I and II

Method	Drug	Correlation coefficient	% Recovery*	% Assay for tablet*
Method I	IB	0.99992	99.98 - 100.81%	100.01%
	FA	0.9991	99.29-101.13%	100.14%
Method II	IB	0.99991	99.25-100.60%	100.13%
	FA	0.99993	99.00-101.87	100.47%

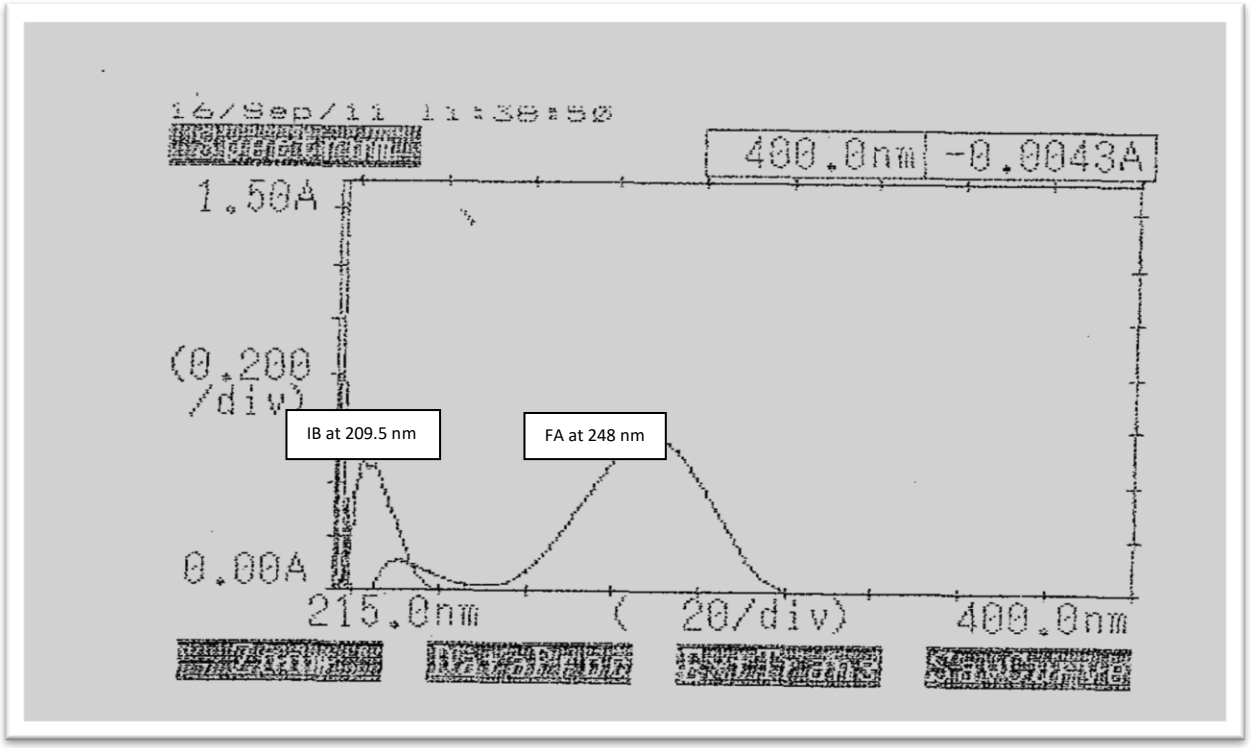

Fig 1: Overlain spectra of Ibuprofen and Famotidine

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