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VISIBLE SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF RABEPRAZOLE IN PHARMACEUTICAL FORMULATIONS

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ABSTRACT

Five simple and sensitive spectrophotometric methods for the estimation of Rabeprazole in pure form and in pharmaceutical formulations in visible region have been developed. The drug having amino group reacts with acidic dyes like Bromo thymol blue (BTB), Bromo cresol green (BCG), Bromo cresol purple (BCP), Amido black (AB) and Alizarin (AZ) in acidic medium producing colored chromogen, which is extracted with chloroform and exhibits λ at 424 nm, 430 nm, 422 nm, 636 nm and 437 nm, respectively. Good agreement with Beer's law was found in the range of 10 to 40 µg/mL for Method A, 15 to 40 µg/mL for Method B, 10 to 25 µg/mL for Method C, 10 to 60 µg/mL for Method D and 200 to 500 µg/mL for Method E. The methods are simple, precise and accurate with excellent recovery of 99.2–101.5%. Commercial dosage forms of the drug have been evaluated by the proposed methods and found to be satisfactory.

Key words : Rabeprazole, Tablets, Spectrophotometry

INTRODUCTION

Rabeprazole[1] (RZ) is a H_2 receptor antagonist used in the therapy of gastric and duodenal ulcers. It is not official in any pharmacopoeia. Chemically RZ is 2–{[[4(3–methoxy propoxy)–3–methyl–2–pyridinyl]–methyl]–sulfinyl}–1H–benzimidazole[2] Literature survey revealed the presence of two HPLC[3–4] methods, a UV Spectrophotometric[3] and a Voltametric method[5] for the estimation of RZ in biological fluids. Since no methods have been reported for the estimation of RZ in pharmaceutical formulations attentions have been focused on developing simple spectrophotometric methods exploiting the amino group of the drug. In this paper authors present five spectrophotometric methods using various dyes namely BTP, BCG, BCP, AB and AZ. It is known that the amino group forms a chloroform extractable complex with the dyes in acidic medium. This reaction has been used as a basis for development of these simple visible spectrophotometric methods for the estimation of RZ in pharmaceutical formulations.

* For Correspondence

EXPERIMENTAL

Instruments

a) A Systronic UV–Visible spectrophotometer–119 with 1 cm matched quartz cell was used for spectral measurements.

b) An Elico–120 digital pH meter for pH measurements.

Reagents

All the chemicals used were of analytical grade and all the solutions were prepared in double distilled water. Freshly prepared solutions were always used.

1) Bromo thymol blue (BTB) : 0.05% in distilled water
2) Bromo cresol green (BCG) : 0.05% in distilled water
3) Bromo cresol purple (BCP) : 0.05% in distilled water
4) Amido black (AB) : 0.05% in distilled water
5) Alizarin (AZ) : 0.05% in distilled water
6) Hydrochloric acid buffer : pH 1.5 and 2.0
7) Acid phthalate buffer : pH 2.2 and 2.6

Commercial tablets of RZ were procured from local market.

Preparation of standard drug solution : A standard drug solution of RZ containing 1 mg/mL was prepared by dissolving 100 mg of drug in 100 mL of distilled water. It was further diluted with distilled water to get a working standards drug solution of 100 µg/mL.

Preparation of sample drug solution : Ten tablets of each formulation T_1 and T_2 containing 10 mg and T_3 and T_4 containing 20 mg of RZ were accurately weighed and powdered. Weight of tablet powder equivalent to 50 mg of drug was dissolved in 20 mL of distilled water and shaken for 15 min and filtered through a Whatman filter paper and was made up to 100 mL with distilled water. This solution was further diluted step wise as given in working standard drug solution and the amount of drug was estimated under the given assay procedure for bulk samples.

Assay procedure : Aliquots of RZ (1.0 – 6.0 mL, 100 µg/mL) for method A, B, C and D and (2.0, –8.0 mL, 1000 µg/mL) for method E were transferred to a 125 mL separating funnel, followed by 2 mL of buffer solution pH 2.6, 2.2, 2.0, 2.6 and 1.5 and 2 mL of dye solutions BCB for method A, BCG for method B, BCP for method C, AB for method D and AZ for method D, respectively. The total volume was adjusted to 10 mL with distilled water and kept at room temperature for 10 min and then successively extracted twice with 5 mL portion of chloroform. The chloroform layer was separated and the absorbance were measured at 424 nm, 430 nm, 422

nm, 636 nm and 437 nm for method A, B, C, D and E respectively. The concentration of RZ were computed from the calibration curve.

RESULTS AND DISCUSSION

Experiments were carried out to optimize reaction condition for complete color formation. It was found that 2mL of dye solution and 2mL of respective buffer solution were optimum for the achievement of maximum color intensity. The optical characteristics such as Beer's law limit, Sandell's sensitivity, molar absorptivity and regression equations for the calibration plot were calculated for all the five methods and summarized in Table 1. The precision and accuracy were found by analyzing six replicate samples containing known amount of the drug and the results are summarized in Table 1. The analysis results of marketed formulations (Table 2) were

Table 1. Optical characteristics and precision of the proposed methods

Parameter	Method A	Method B	Method C	Method D	Method E
λ_{max} (nm)	424	430	422	636	437
Beer's law limit (µg/mL)	10–40	15–40	10–25	10–60	200–500
Molar absorptivity (L mol^{-1} cm^{-1})	8.33 x 10^3	7 x 10^3	9.68 x 10^3	5.44 x 10^3	0.31 x 10^3
Sandell's sensitivity (mg cm^{-2} per 0.001 absorbance unit)	0.040	0.0484	0.03505	0.062	1.071
Regression equation, (y = a+bC)*					
Slope (b)	0.0243	0.01812	0.016	0.011	0.0008
Intercept (a)	0.0005	0.049	0.028	0.0157	0.0319
Correlation coefficient (r)	0.9970	0.9999	0.9976	0.9933	0.9993
Relative standard deviation (%)**	0.043	0.068	0.054	0.121	0.032

*Y = a + bC, where C is concentration of analyte and Y is absorbance unit
** average of six determinations.

Table 2. Assay RZ in pharmaceutical formulations by the proposed methods

Drug*	Lable Claim mg/tablet	Amount found by proposed Methods** (mg)					% Recovery by proposed methods***
		Method A	Method B	Method C	Method D	Method E	
Tablet 1	10	99.20	99.20	100.20	99.03	99.06	99.25±0.85
Tablet 2	20	100.30	100.80	99.00	99.10	99.80	99.80±0.22
Tablet 3	10	100.30	99.50	99.40	99.55	100.80	99.60±0.67
Tablet 4	20	99.35	99.30	99.25	100.40	99.65	99.80±0.58

* Drugs from different pharmaceutical companies; ** Average of 6 determinations; *** Recovery of 10 mg added to the preanalysed pharmaceutical dosage forms (Average of 3 determinations).

in good agreement with their labeled claim. The low values of standard deviation indicate high accuracy, reproducibility and reliability of the methods. As an additional check on the accuracy of the methods, recovery experiments were performed by adding known amount of the pure drug to preanalysed dosage forms and the results obtained were listed in Table 2. The proposed methods can be employed for the routine determination of Rabeprazole in bulk and pharmaceutical formulations.

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