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Research Article

Validated UV Spectroscopic Method for Estimation of Montelukast Sodium from Bulk and Tablet Formulations

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ABSTRACT

A simple, sensitive and specific UV spectrophotometric method was developed for the estimation of Montelukast Sodium in bulk and in tablet dosage form. The optimum conditions for the analysis of the drug were established. The wavelength maxima (λ_{max}) for Montelukast Sodium were found to be 287.3nm. The linearity for this method was found to be in the range of 2-100 µg/ml. The method showed high sensitivity with reproducibility in results. The calibration curve was drawn by plotting graph between absorbance and concentration. Method showed a correlation coefficient (r) of 0.999. The regression equation of the curve was y = 0.034x + 0.004. This sensitive method was capable to recover accurately and precisely from 80 % level to 120 % level of target concentration. The proposed method may be suitably applied for the analysis of Montelukast Sodium in bulk and in tablet pharmaceutical formulation for routine analysis.

Keywords: Montelukast Sodium, UV Spectroscopy, Tablet dosage form, Analysis.

INTRODUCTION

Montelukast Sodium (1-[[[(1R)-1-[3-[(1E)-2-(7-chloro-2-quinolinyl) ethenyl] phenyl]-3-[2-(1-hydroxy-1- methylethyl) phenyl] -propyl] thio] methyl] cyclopropaneacetic acid, monosodium salt is a white colored powder and it is freely soluble in ethanol, methanol, and water. Molecular weight of Montelukast Sodium is 608.2 g/mol and formula is $C_{35}H_{35}C_lNO_3S.Na$. For structure refer Figure **1**[1-3]**.** Montelukast (sodium salt) is potent, selective CysLT1 receptor anatagonist. It is indicated for the prophylaxis and chronic treatment of asthma in adults and pediatric patients. The drug is commercially available in various forms of once-daily oral dosage formulations including oral granules. In oral dosage form, each packet contains Montelukast Sodium equivalent to 10 mg of Montelukast. Several analytical methods have been reported for determination of Montelukast including derivative spectroscopic[4], by colorimetry[5], by flouorimetry[6], by TLC[7], by HPTLC[8], by simultaneous UV determination in combination drug formulation[9], by voltametry[10], by high performance liquid chromatography (HPLC) [11] and by LCMS[12]. To our knowledge, there is no simple and accurate UV spectrophotometric method for quantitative determination of Montelukast Sodium in its bulk and in its tablet dosage forms. Pharmacopeias have not yet provided any compendial or official method for its quantification. The objective of study to develop and validate a simple, eco-friendly UV spectrophotometric method for the determination of Montelukast in Montelukast Sodium oral dosage forms (strength is 10 mg as Montelukast). Also method should be capable to apply in routine Quality control analysis. Analytical parameters for the method have also been established and compared with those established and existing HPLC method.

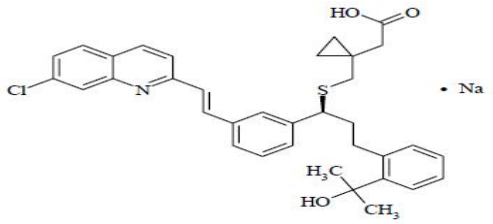

Fig. 1: Structure of Montelukast Sodium

Experimental

Instrument

Spectrophotometric determinations were carried out on 'Systronics' double beam UV-Visible spectrophotometer model (2203) with 1 cm quartz cell.

MATERIALS

All the reagents used were of Anal R grade. Montelukast Sodium was a gifted sample obtained from Dr. Reddy's Laboratories Ltd., Hyderabad, India. Sodium Lauryl Sulphate (AR grade, Merck) and double distilled water were used for analysis. Romilast™ (Ranbaxy Pharma) is a marketed formulation of Montelukast Sodium procured from local pharmacy.

METHODS

Preparation of dilution medium

For the preparation of dilution medium firstly 7.4 pH Phosphate buffer was prepared. The prepared buffer was sonicated for few minutes for obtaining uniform solution. Further 0.5% Sodium Lauryl Sulphate was mixed uniformly.

Preparation of Standard Montelukast Sodium Solution

About 10mg of Montelukast Sodium pure drug was weighed accurately and transferred into 10ml volumetric flask. The volume was made up to 10ml using ethanol to obtain a solution that has a concentration equal to 1 mg/ml standard solution.

Preparation of Montelukast Sodium Sample solution

Randomly selected Romilast tablets were weighed initially and crushed to powder. Powder quantity equivalent to 10mg was weighed accurately and transferred to 10ml volumetric flask. Further dilutions were made using the dilution media.

Procedure for construction of calibration curve

To a series of 10ml volumetric flasks, carefully transferred aliquots of standard drug solution (0.2 to 1.0 ml, 10µg/ml) and the volume was made with the diluents. The instrument was for photometric mode and the absorbances of each solution were recorded at 287.3nm against the blank diluents. Calibration curve was constructed by taking absorbances on ordinates and concentration of the standard Montelukast Sodium on abscissa. Mean absorbance values are shown in Table 1.

Procedure for Assay

To a cleaned 10ml volumetric flask transferred a few ml of sample solution of Montelukast Sodium and the volume was made with the diluents. Absorbance of the resulting solution was recorded at 287.3nm against its corresponding blank prepared in a similar manner except adding the substance being analyzed. The concentration of Montelukast Sodium present in the tablet dosage form was computed from its calibration curve.

Stability

Stability of the solutions of montelukast, used for preparing the calibration curves in the method,
was ascertained by observing for changes in the absorbance at their respective analytical wavelengths over a period of 24 h.

RESULTS AND DISCUSSION

Linearity was observed for various concentrations ranging from 2 – 100 µg/ml in dilution media (Table 1). Specificity and selectivity of Montelukast solutions (10 µg/ml) prepared in dilution media along with and without common excipients were checked for change in the absorbance at wavelength 287.3 nm. The optical characteristics of the proposed method were summarized in Table 2. Precision of the method was conducted for solutions containing known amounts of pure drug. Precision of the method was found to be 1.625 ± 0.324 against the label claim of 10mg. The analytical results obtained from these investigations for the methods are summarized in Table 3. The accuracy of the method for the estimation of the drug in presence of various tablet excipients was investigated. Results of these determinations are included in Table 4. The Limit of detection and Limit of Quantification of montelukast by the proposed method was determined using calibration standards and shown in Table 2. The lower limit of detection (LOD) and the limit of quantification (LOQ) were found to be 1.234and 3.735 respectively. Recovery studies were performed for Montelukast drug solutions and the results were tabulated in table 5.

CONCLUSIONS

Montelukast can be estimated using this method at 287.3 nm. It has the advantages of simplicity, stability, sensitivity, reproducibility and accuracy and is associated with higher sensitivity and precision. The non – interference of tablet excipients makes the method suitable for the estimation of the drug in tablets and hence can be used for routine quality control of montelukast formulations of all potencies and in forensic sciences involving the estimation of montelukast. It is recommended strongly that a bath sonicator be used when the method is being used for estimation to ensure fast and complete dissolution of the drug.
Results of the above study indicate the suitability of the method to estimate montelukast in bulk as well as in dosage formulations. The developed method is comparable to any HPLC method elaborated in the literature. This may also be selected as an alternative to the existing, time-

consuming and dear methods like gas chromatography and reversed-phase high performance liquid chromatography (RP-HPLC).

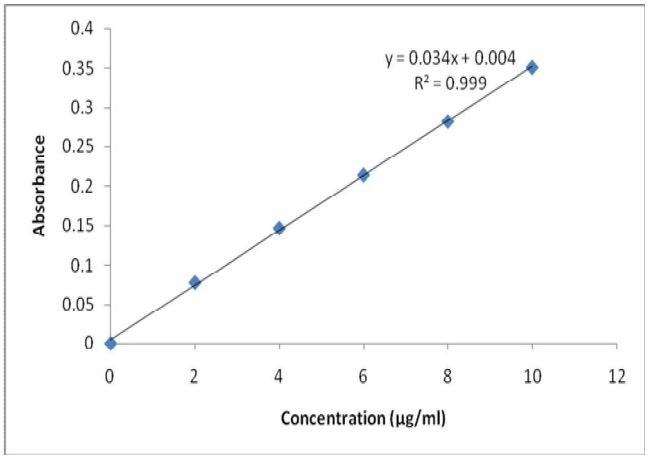

Fig. 2: Calibration curve of Montelukast Sodium

Table 1: Mean absorbance values and statistical data of the calibration curve for the estimation of montelukast

S. No	Concentration (µg/ml)	Mean Absorbance* ± S.D
1	2	0.0776 ± 0.00046
2	4	0.1466 ± 0.00011
3	6	0.2136 ± 0.00013
4	8	0.2816 ± 0.00026
5	10	0.3506 ± 0.00029

* Mean of five values

Table 2: Optical Characteristics of Proposed Method

Parameter	Montelukast values
Linearity range (µg/ml)	2-100µg/ml
Regression equation (Y*)	y = 0.004 + 0.034x
First regression coefficient (b)	0.034
Intercept (a)	0.004
Standard deviation of the intercept (S_a)	$1.27 * 10^{-2}$
Correlation coefficient	0.999
Standard error of estimation	$3.5 * 10^{-3}$
Limit of Detection (LOD)	1.234
Limit of Quantification (LOQ)	3.735

***** Y = a + bX where X is the concentration of the drug in µg/ml and Y is the amplitude at the specified wavelength

Table 3: Precision of the method (n=5)

Name/type of the dosage form	Label Claim (mg/tab)	Amount found by the proposed method		Amount found by the reference method	
		Inter day	Intra day	Inter – day	Intra – day
Tablet*	10	10.21 ± 0.02	9.7 ± 0.041	10.01 ± 0.32	9.61 ± 0.12

* Romilast™ marketed Formulation

Table 4: Accuracy of the method (n=5)

Name of the formulation	Label Claim (mg)	Level (%)	Amount found (mg)	% Recovery
Tablet	10	80	18 ± 0.51	99.46
Tablet	10	100	20 ± 0.32	100.90
Tablet	10	120	22 ± 0.28	100.64

Table 5: Determination of Montelukast in sample solutions

Amount (µg/ml)	Recovery (mean* ± RSD)
Montelukast	100.13 ± 0.72

***** Average of five determinations

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