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VALIDATED SPECTROPHOTOMETRIC METHOD FOR THE QUANTITATION OF QUETIAPINE FUMARATE IN BULK AND TABLET DOSAGE FORM

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ABSTRACT

Simple, precise and accurate zero order derivative spectroscopic method has been developed and validated for the estimation of Quetiapine fumarate in bulk and pharmaceutical dosage form. The drug shows maximum absorption (λ max) at 226nm in Methanol: 1N NaOH (50:50) solution and obeys Beer's law in the concentration range of 2-10µg/ml. The linearity study was carried out and regression coefficient was found to be 0.9996=b and it has showed good linearity, precision during this concentration range. The % recovery was found to be 100.81-101.35. The LOD and LOQ were found to be 0.388 and 1.17µg/ml. The percentage relative standard deviation were found to be less than 2. Aa per the ICH guidelines the technique has been validated for linearity, precision, accuracy, robustness, ruggedness, LOD and LOQ. The developed and validated method can be successfully applied for routine quantification of Quetiapine fumarate in bulk and pharmaceutical dosage form.

KEYWORDS

Quetiapine fumarate zero order derivative spectroscopy, Validation and Pharmaceutical formulations.

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INTRODUCTION

Quetiapine fumarate is a second-generation atypical antipsychotic medication used to treat certain mental /mood disorders (such as schizophrenia, bipolar disorder, sudden episodes of mania or depression associated with bipolar disorder)[1].

Literature survey revealed that there were few analytical methods have been reported for the determination of Quetiapine fumarate in pure drug and pharmaceutical dosage forms by using UV spectrophotometric[2-7], HPLC[8-16], HPTLC[17,18] and UPLC[19,20] so far.

The aim of present work is to develop and validate a novel, rapid, simple, precise and specific Zero order derivative UV Spectrophotometric method for estimation of Quetiapine fumarate in bulk and tablet dosage form.

MATERIAL AND METHODS

Instrument

UV-Visible double beam spectrophotometer, SHIMADZU (model UV-1800) along with UV probe software. All weights were taken in analytical balance.

Chemicals

Quetiapine fumarate pure drug was obtained as a gift sample from Hikal Ltd, Jigani, Bengaluru and its pharmaceutical dosage form Quetiapine fumarate 20 tablet labelled claim 50mg from local pharmacy manufactured by Elite Pharma India Ltd.

Solvent

Methanol: 1N NaOH (50:50) used as a solvent.

Selection of analytical wavelength

Appropriate dilutions of Quetiapine fumarate were prepared from standard stock solution and using spectrophotometer solution was scanned in the wavelength range 200-400nm. The absorption spectra obtained and show maximum absorbance at 226nm, as the wavelength for detection (Figure No.2).

Preparation of 1N NaOH

40gm of Sodium hydroxideis transferred into 1000ml volumetric flask and make up the volume up to the mark with distilled water.

Preparation of standard stock solution

100mg of Quetiapine fumarate was weighed accurately and transferred in to 100ml volumetric flask and diluted in Methanol: 1N NaOH (50:50) up to mark. From this, the solution was further diluted into 100µg/ml and pipetted out 0.2, 0.4, 0.6, 0.8, and 1ml, into 10ml individual volumetric flask and diluted in Methanol: 1N NaOH (50:50) up to the mark and this gives 2, 4, 6, 8 and 10µg/ml concentration.

Preparation of sample solution

10 tablets of Quetiapine fumarate marketed formulations was weighed and powdered. A quantity of tablet powder equivalent to 100mg of Quetiapine fumarate was transferred into a 100ml of volumetric flask then it was diluted with Methanol:1N NaOH (50:50) and made up to the mark.

Method and validation

The method was validated according to the ICH guidelines.

RESULTS AND DISCUSSION

Method: Zero order derivative spectroscopy

Linearity

The linearity of an analytical method is its dimension to show the test results that are directly proportional to the concentration of the analyte in the sample within the range. The linearity was established in the range of 2-10µg/ml was measured at 226nm and absorbance values are shown in Table No.1. The calibration curve was prepared by plotting graph against the concentration and absorbance and therefore the graph shown in Figure No.3. Statistical variables like slope, intercept, regression equation, correlation coefficient and sandell's sensitivity were determined. (Table No.2).

Precision

The precision of an analytical method expresses the closeness of a series of individual analyte measurements obtained from multiple sampling of the equivalent sample. Precision was established by intra-day and inter-day studies. Intra-day precision was determined by analysing the same concentration for six times in a same day. Inter-day precision was determined by analysing the same concentration daily for six days. (Table No.3).

Accuracy

The accuracy of an analytical method says that closeness of test results obtained by that method to the true value. To assess the accuracy of the developed method, recovery studies were carried out at three different levels as 50%, 100% and 150%. In which the formulation concentration holds it constant and varied pure drug concentration. (Table No.4).

Ruggedness

The ruggedness is defined as the reliability of results when the method is performed under the variation in conditions. This includes distinct

analyst, laboratories, instruments, temperature etc. Ruggedness was determined between distinct analyst, the value of % RSD was found to be less than 2. (Table No.5).

LOD and LOQ

The limit of detection is an individual analytical method is the smallest amount of analyte in a sample which can be reliably detected by the analytical method.

The limit of quantitation is an individual analytical procedure is the smallest amount of analyte in a sample which can be quantitatively determined. LOD and LOQ was calculated by using following formula.

LOD = 3.3(SD)/S and LOQ = 3(LOD) LOD and LOQ value of were found Quetiapine fumarate be 0.388 and 1.17µg/ml.

Table No.1: Results of calibration curve at 226nm by zero order spectroscopy

S.No	Concentration in µg/ml	Absorbance ± Standard deviation*
1	0	0
2	2	0.216±0.000957
3	4	0.413±0.00179
4	6	0.603±0.00181
5	8	0.799±0.00449
6	10	0.993±0.00125

*Average of six determinations

Table No.2: Regression parameter Quetiapine fumarate for by zero order spectroscopy

S.No	Regression parameter	Results
1	Range (µg/ml)	2-10
2	λ_{max}(nm)	226
3	Regression Equation	Y= 0.0986x+0.0109
4	Slope (b)	0.098
5	Intercept (a)	0.0115
6	Correlation coefficient(r^2)	0.9996
7	Sandell's equation	0.0099
8	Limit of detection (µg/ml)	0.388
9	Limit of quantitation (µg/ml)	1.17

Table No.3: Determination of precision results for Quetiapine fumarate at 226nm by zero order spectroscopy

S.No	Concentration (µg/ml)	Intra-day Absorbance ±Standard deviation*	%RSD**	Inter-day Absorbance ±Standard deviation*	%RSD**
1	2	0.223±0.0017	0.76	0.221±0.00074	0.33
2	4	0.426±0.00125	0.29	0.425±0.00068	0.16
3	6	0.616±0.0011	0.17	0.615±0.00068	0.11
4	8	0.811±0.0011	0.13	0.809±0.00076	0.094
5	10	0.981±0.00095	0.096	0.977±0.00094	0.096

*Average of six determinations, **percentage relative standard deviation.

Table No.4: Determination of accuracy results for Quetiapine fumarate at 226nm by zero order spectroscopy

S.No	Spiked Levels	Amount of Sample (µg/ml)	Amount of Standard (µg/ml)	Amount Recovered	% Recovery ±Standard deviation*	%RSD**
1	50	6	3	9.02	100.9 ±0.235	0.232
2	100	6	6	12.16	101.3 ±0.809	0.798
3	150	6	9	15.08	100.8 ±0.673	0.667

*Average of six determinations, **percentage relative standard deviation.

Table No.5: Determination of Ruggedness results for Quetiapine fumarate at 226nm by Zero order spectroscopy

S.No	Analysts	Analyst 1	Analyst 2
1	Mean absorbance	0.608	0.611
2	±Standard deviation*	0.0011	0.0019
3	%RSD	0.180	0.313

*Average of six determinations, **percentage relative standard deviation

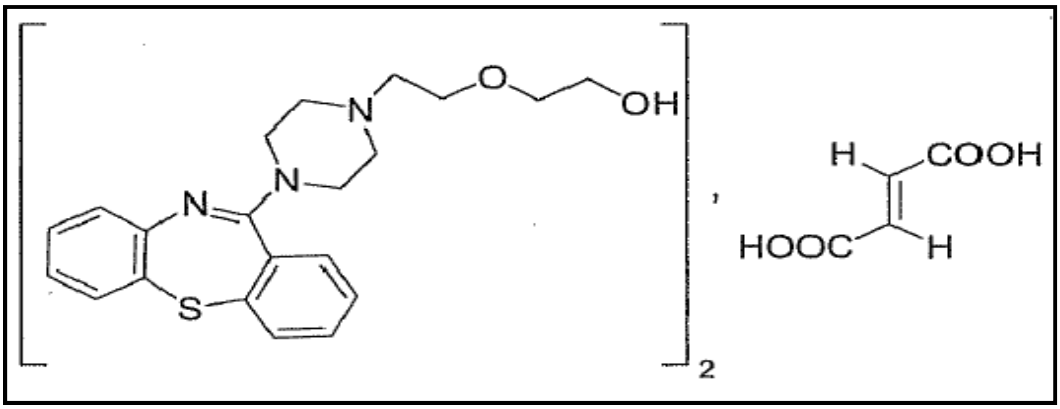

Figure No.1: Chemical structure of Quetiapine fumarate

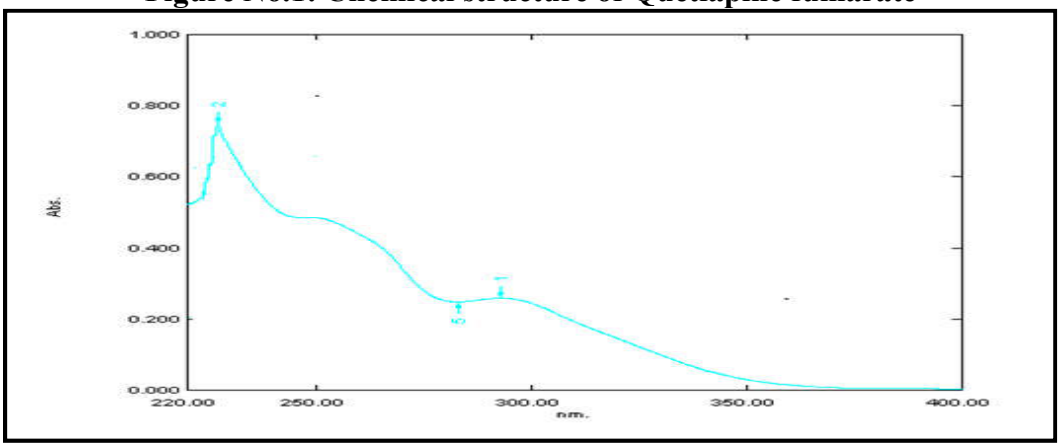

Figure No.2: Zero order spectrum of Quetiapine fumarate at 226nm

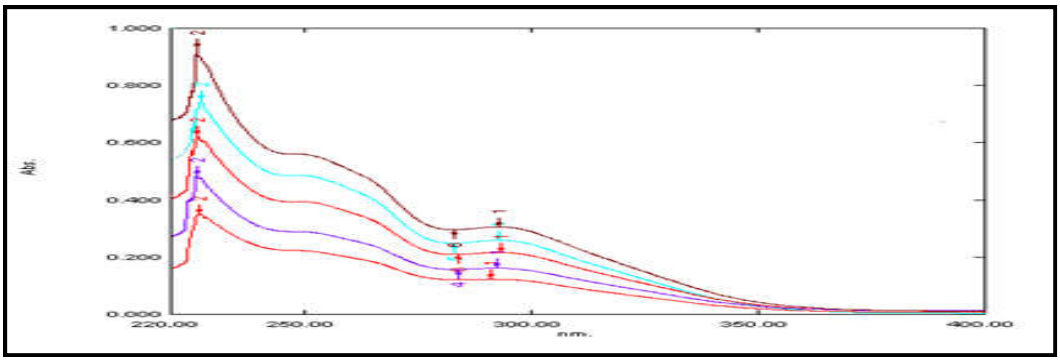

Figure No.3: Zero order overlain spectra of Quetiapine fumarate showing absorbance at 226nm

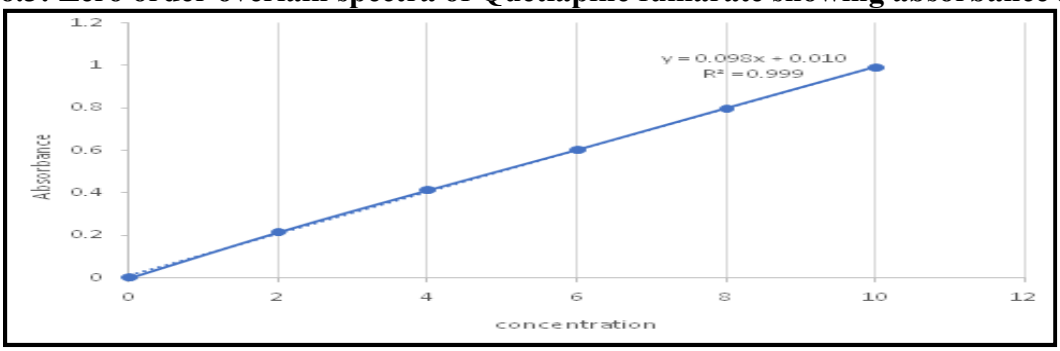

Figure No.4: Calibration curve of Quetiapine fumarate by zero order spectroscopy

CONCLUSION

As per ICH guidelines, the developed analytical method meets the acceptance criteria. It was concluded that the method is simple, specific, accurate, economical and sensitive and can be used for routine analysis of Quetiapine fumarate in bulk drug and in pharmaceutical dosage forms.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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