Research Article
AMERICAN JOURNAL OF PHARMACY AND HEALTH RESEARCH
www.ajphr.com
2015, Volume 3, Issue 4
ISSN: 2321–3647(online)

UV-Spectrophtometric Assay Method for the Assay of Tolterodine in Pure and Formulations

Siva Shankar Rao G[1], P.S.Sarat[1], Ramachandran D[1]*
1. Department of Chemistry, Acharya Nagarjuna University,Guntur,AP,India.

ABSTRACT

A simple, cost effective and reproducible UV-spectrophotometric method has been developed and validated for the assay of Tolterodine in pure and dosage forms. This assay is based on measurement of absorption at maximum wavelength of 282nm. Beer's law of this proposed method was obeyed in the concentration range of 60-120µg/mL with regression equation of y = 0.0068x-0.0117 and with correlation coefficient of 0.9988 respectively. The percentage recovery of tolterodine ranged from 99.93- 100.37 in pharmaceutical dosage form. The results of the analysis for linearity, accuracy (recovery), precision and specificity were validated statistically and by recovery studies in accordance with ICH norms.

Keywords: Tolterodine, UV-Spectrophotometry.

*Corresponding Author Email: svm2032@gmail.com
Received 22 March 2015, Accepted 27 March 2015

Please cite this article as: Ramachandran D *et al*., UV-Spectrophtometric Assay Method for the Assay of Tolterodine in Pure and Formulations. American Journal of Pharmacy & Health Research 2015.

INTRODUCTION

Tolterodine [2- [(1,S)-3-(di-isopropylamino)-1-phenylpropyl]-4- methylphenol][1,2] is an antimuscarinic drug is used to treat urinary incontinence. It acts on M1,M2, M3, M4 and M5 subtypes of muscarinic receptors whereas modern antimuscarinic treatments for overactive bladder only act on M3 receptors making them more selective. Literature survey reveals that few analytical methods[3-8] have been reported for the quantitative estimation of Tolterodine in bulk drug and pharmaceutical formulation. Hence an attempt has been made to develop new UV-spectrophotometric method for its estimation in bulk and pharmaceutical formulation with good precision, accuracy, linearity and reproducibility. This validated method was applied to the commercially available pharmaceutical formulations containing tolterodine.

MATERIALS AND METHOD

A. Apparatus

In the present paper assay of tolterodine in pure and in market brands was made by using UV-visible spectrophotometer (Shimadzu Model 160-A, Kyoto, Japan) in the range of λ 200-400nm, using methanol as blank. The output signal was monitored and integrated using Dell computer equipped with Empower software that was used to compute the standard regression curve analysis, and to calculate the mean, SD, %RSD and %recovery respectively. analytical electronic balance was used.

B. Materials, Reagents and Chemicals

Analytically pure (100 %) Tolterodine was gifted form Torrent Pharmaceutical Ltd., (Ahmedabad, India), along with Certificate of Analysis. Market formulation in the brand name Terrol LA [Label claim 4.0mg of Tolterodine] manufactured by Cipla pharmaceuticals Ltd were procured form local pharmacy. All other chemicals and reagents used in the present study were of analytical grade. Milli-Q water was used throughout the experiment.

C. Preparation of Stock Solution and Calibration Standards and Procedural Method

Accurate amount of 100mg of pure tolterodine was weighed and transferred to 100ml volumetric flask. 50 ml of Methanol was added into the flask and the flask was shaken manually till complete dissolution occurred and the final volume was made upto mark with the same diluents to obtain the final concentration 1000µg/ml of tolterodine. An appropriate aliquot portion of tolterodine solutions (0.5, 1, 1.5, 2, 2.5 and 3.0 ml) from the above standard stock solution was carefully transferred to 10ml volumetric flasks and diluted with same diluent to obtain the final concentration of 20, 40, 60, 80, 100 and 120µg/ml of tolterodine. All the solutions were scanned

separately between 200nm to 400nm in UV-visible spectrophotometer and the λ_{max} for tolterodine were recorded. At this fixed wavelength a calibration curve constructed with the absorbance is so obtained versus the concentration ranges and the regression analysis for linearity plot was made for the developed method using stastically approach respectively.

D. Analysis of tolterodine in market formulations

Contents of 10 tablets of one brand [Terrol LA; Label claim -4.0mg] purchased from the local pharmacy were weighed and crushed to make fine powder using porcelain mortar and pestle. Briefly, a quantity of powder having an equivalent amount of 100mg of tolterodine was weighed and dissolved in methanol in 100ml volumetric flask and filtered through Whatmann filter paper to get the final concentration of tolterodine 1.0mg/ml (stock solution). Further different concentrations of tolterodine that obey within the linearity limits was prepared by transferring of different aliquots of stock solution of tolterodine into 10ml volumetric flask and diluting the mark with the same diluents and concentration of tolterodine in tablets was determined accordingly as described in previous section.

RESULTS AND DISCUSSION

The developed method has been validated by evaluation of the linearity, sensitivity, precision, accuracy and recovery as per ICH guidelines. The linearity of the proposed UV-Spectrophotometric method for quantitative analysis of tolterodine was made by plotting calibration curve using the absorbencies' over the concentration ranges cited. Least square regression analysis was used to analyze the slope, intercept and correlation coefficient and the data showed a good linear relationship with a correlation coefficient (r2) of 0.9988. It was also found that the developed method was found to be linear in the concentration range 20-120µg/ml with good correlation in between concentration and absorbance (Table.1). The LOD and LOQ of the developed UV-visible spectrophotometric method was made using the slope of the calibration curve and standard deviation of the response according to the guidelines of the ICH and the LOD and LOQ values for tolterodine was found 4.08µg/ml and 13.611µg/ml for tolterodine respectively indicating the high sensitivity of the developed method. The precision of the developed UV-Spectrophotometric method was determined by repeatability studies which were carried out by repeating the analysis of tolterodine samples for 6 times. The %RSD value for precision was found to be less than <2% (Table.2) revealing that the developed method was precise. Accuracy of the present method was evaluated by subjecting the drug solution, at three different concentrations equivalent to 50, 100, and 150% of the active ingredient, by adding a

known amount of tolterodine standard to a sample of known concentration in triplet and calculating the recovery of tolterodine for each concentration level. The mean % recoveries were in between 99.93-100.37% and were given in Table. 3 revealing the good accuracy of the developed method. A ruggedness study for tolterodine was also made with proposed method between two different analysts and the results of these studies were presented in Table.4. The values of percentage RSD for tolterodine were below 2.0% revealed the ruggedness of developed analytical method. This method was applied to determine the content of tolterodine in market samples (tablet-forms). The content and percentage of tolterodine in market sample was found to be 3.97mg with an % recovery of 99.25±0.1%, respectively (n=3) (Table.5).

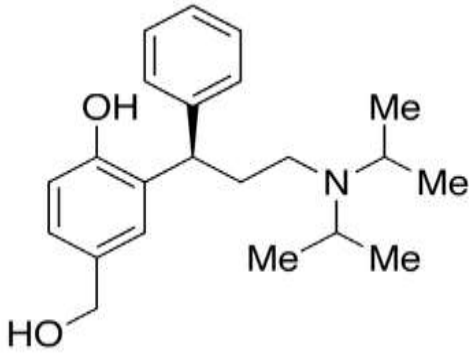

Figure 1: Molecular Structure of Tolterodine

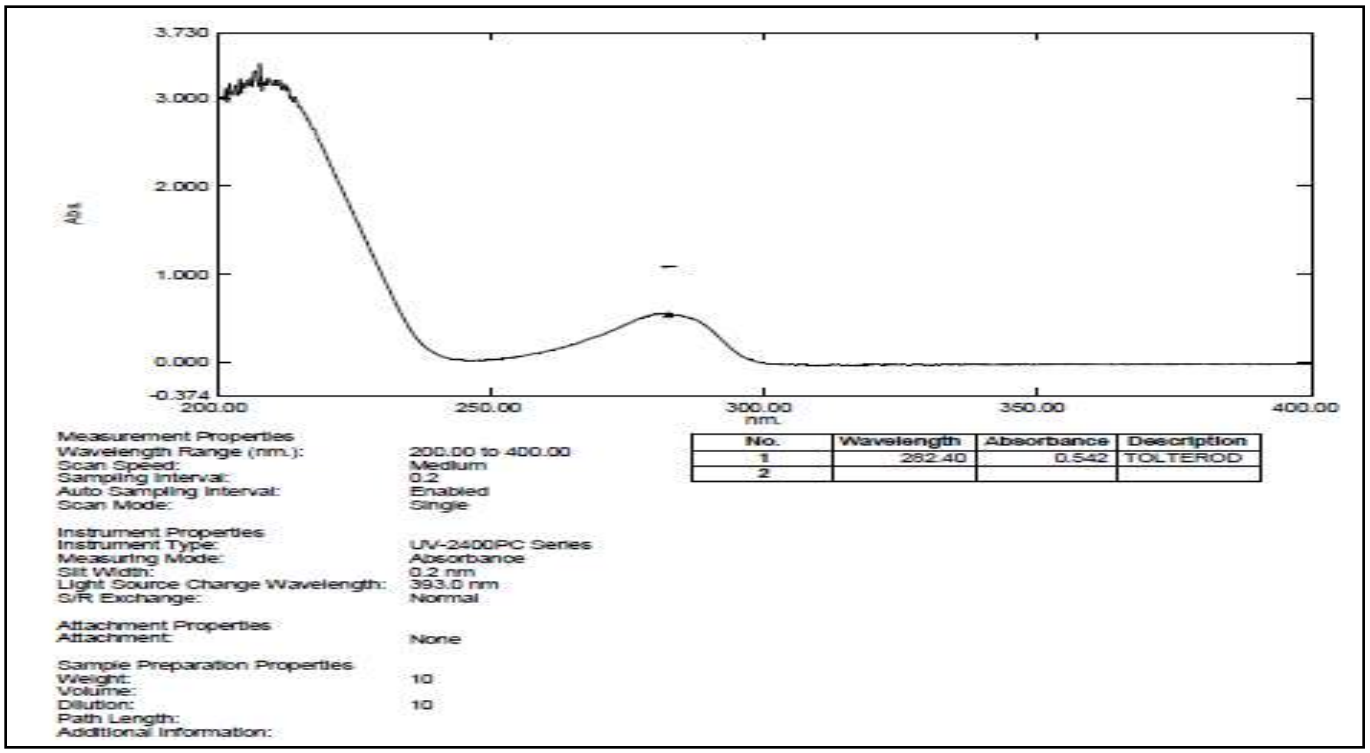

Figure 2: Validated UV Spectra of Tolterodine

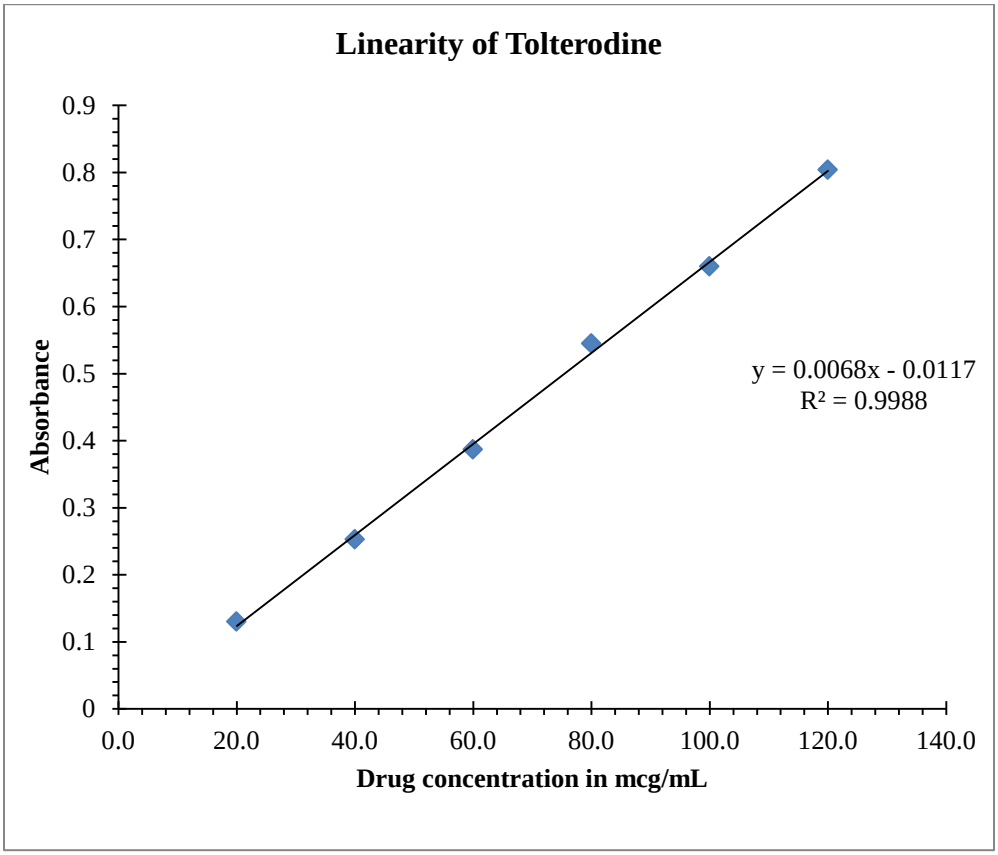

Figure 3: Linearity Curve for Tolterodine

Table 1: Linearity and Optical Characteristics of Tolterodine by the Proposed Method

Linearity of Response for Tolterodine		
% Level (approx.)	**Concentration (µg/mL)**	**Average ABS.**
25	20.0000	0.13
50	40.0000	0.253
75	60.0000	0.387
100	80.0000	0.545
125	100.0000	0.66
150	120.0000	0.804
Slope		0.0068
Intercept		-0.0117
RSQ(r2)		0.9988
LOD (µg/mL)		4.08
LOQ (µg/mL)		13.611

Table 2: Precision Studies of Tolterodine by the Proposed Method

S NO	Name	ABS
1	solution-1	0.558
2	solution-2	0.549
3	solution-3	0.552
4	solution-4	0.55
5	solution-5	0.548

6	solution-6	0.555
AVG*		0.552
STD DEV*		0.003847
% RSD*		0.6969

*Average of six determinations

Table 3: Recovery Studies for Tolterodine by the Proposed Method

Accuracy	**50%**	**100%**	**150%**
S NO	Area	Area	Area
Injection-1	0.375	0.502	0.629
Injection-2	0.377	0.501	0.628
Injection-3	0.372	0.501	0.629
AVG *	0.375	0.501	0.628
amt Recovered*	49.97	100.00	150.56
%Recovery*	99.93	100.00	100.37

*Average of three determinations

Table 4: Ruggedness Studies for Tolterodine by the Proposed Method

S NO	**Name**	**RT**	**S NO**	**Name**	**RT**
1	scan-1	0.558	1	scan-1	0.545
2	scan-2	0.549	2	scan-2	0.549
3	scan-3	0.552	3	scan-3	0.552
4	scan-4	0.55	4	scan-4	0.556
5	scan-5	0.548	5	scan-5	0.551
6	scan-6	0.555	6	scan-6	0.554
AVG*		0.552	AVG*		0.551
STD DEV*		0.004	STD DEV*		0.004
% RSD*		0.697	% RSD*		0.702

*Average of six determinations

Table 5: Results of Analysis in Formulations

Drug	**Label claim**	***quantity found**	**% assay**
Terrol LA	4.0	3.97	99.25

*Average of three determinations

Table 6: Summary of Validation Parameters of Proposed UV Spectrophotometric Method of Tolterodine

Parameter	**Experiment**	**Observation**	
Specificity	blank interference	No absorbance was found	
Precision	Repeatability	0.6969	
Accuracy	Recovery of analyte from placebo on triplicate samples	50%	99.93
		100%	100
		150%	100.37
Linearity	Coefficient of correlation(r^2)	0.9988	
Ruggedness	Analyst to analyst variation	Analyst to Analyst	

	Analyst-1	Analyst-2
	%RSD: 0.697	%RSD: 0.702

CONCLUSION

All the above results indicated that, the proposed UV-Spectrophotometric method is very simple, accurate, precise, and sensitive for the assay of tolterodine concentration in pure and in pharmaceutical preparations. The developed method gave a linear calibration curve y = 0.0068x-0.0117 and with correlation coefficient of 0.9988 respectively. The % RSD and % recovery for precision and accuracy was found within the acceptance criteria. Complete validation of this proposed method was accomplished in accordance to ICH norms, and the validation results are summarized in Table.6 that allowed the feasibility of the proposed method in the analysis of tolterodine in bulk and its pharmaceutical dosage forms.

ACKNOWLEDGEMENTS

The authors are thankful to Bio Lee.Labs- Hyderabad, Andhra Pradesh and Dept of Chemistry, Acharya Nagarjuna University, Guntur, AP, India for providing necessary for providing laboratory facilities to carry out this research.

REFERENCES

1. http://en.wikipedia.org/wiki/Tolterodine.
2. http://www.rxlist.com/detrol-la-drug.htm.
3. Nanda RK, Gaikwad J, Prakash A. Simultaneous spectrophotometric estimation of tolterodine on pharmaceutical dosage form. Research J. pharma. & Tech 2009;2(2): 312-314.
4. Nanda RK, Gaikwad J, Prakash A. Estimation of Tamsulosin and Tolterodine in its pharmaceutical dosage form by Spectrophotometric method. Int. J. pharma. Tech. Res. 2009; 1(3):420-423.
5. Vinay S, Zahid Z, Mazhar. Stability indicating HPLC determination of Tolterodine tartrate in pharmaceutical dosage forms. Indian J. Che. Tech.2006;13(3):242-246.
6. Krishna SR, Rao BM, Rao NS, A validation stability – indicating HPLC method for the determination of related substance and assay of Tolterodine Tartarate. Rasayan J. Chem., 2009;2(1):144-150.
7. Murthy VSN, Keerthy P, Ratanal JV, Nagappa AN, Reverse – phase, high performance liquidchromatographic method for the determination of Tolterodine Tartarate in routin Quality controlsample. J Pharm. Sci. & Tech.2009;63(3):234-239.

8. Sathish Kumar Shetty, Arpan Shah. Development and Validation of Tolterodine by RP-HPLC Method in Bulk Drug and Pharmaceutical Dosage Forms. Int.J. PharmTech Res. 2011; 3(2):1083-1087