INTERNATIONAL JOURNAL OF PHARMACEUTICAL CHEMISTRY RESEARCH
eISSN: 2278 – 8700

RESEARCH ARTICLE

ANALYTICAL METHOD DEVELOPMENT OF TOLPERISONE HYDROCHLORIDE IN TABLET DOSAGE FORM BY UV VISIBLE SPECTROPHOTOMETRY.

Mahaparale S P, Ubale GS, Roy M.

Padm. Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune-411044, Maharashtra, India.

Corresponding author: Dr. (Mrs.) Sonali P. Mahaparale, Padm. Dr. D. Y. Patil College of Pharmacy, Sector No. 29, Pradhikaran, Near ZSI Building, Akurdi, Pune- 411044.

ABSTRACT:

Three simple, precise and economical UV spectrophotometric methods have been developed for estimation of Tolperisone Hydrochloride in bulk and pharmaceutical formulations. Tolperisone Hydrochloride (TOL) has absorbance maxima at 260 nm in zero order spectrum method (Method A), in the first order derivative spectra, showed sharp peak at 247 nm when n = 1 (Method B). Method C is based on calculation of area under curve (AUC) for analysis of Tolperisone Hydrochloride in the wavelength range of 250 nm - 271 nm. The drug followed the Beer-Lambert's law in the concentration range of 5-40 µg/ml in all three methods. Results of the analysis, validated statistically and by recovery studies were found to be satisfactory.

Key Words: Tolperisone Hydrochloride (TOL), Ultraviolet spectrophotometry; Zero order spectrum; first order derivative spectroscopy and Area under curve (AUC).

INTRODUCTION

Tolperisone Hydrochloride is described chemically 2-methyl-1-(4-methylphenyl)-3-(1-piperidyl) propan-1-one. Tolperisone hydrochloride (TOL) is a centrally-acting muscle relaxant used in the treatment of acute muscle spasms in back pain and spasticity in neurological diseases[1,2]. It is piperidine derivative use in treatment of different pathological condition like multicolor sclerosis, myelopathy, cervical and lumbar syndromes and artrosis of the large joints, diabetical angiopathy and tromboangitis obliterans.. It is not official in any of the pharmacopoeia and only listed in the Merck Index and Martindale, The complete drug references.[1, 2.] Literature survey reveals that many analytical methods such as UV spectrophotometric[3-6], HPLC methods[7-10] and HPTLC[11,12] methods are reported for determination of Tolperisone hydrochloride individually from pharmaceutical dosage form and UV spectrophotometric[13], HPLC[14] methods are reported for determination of TOL with other drugs in combined dosage form.

Hence the objective of the work is to develop simple, precise, accurate, sensitive, rapid and economical Zero order, First order and Area under Curve (AUC) UV Visible Spectrophotometric method for the estimation of Tolperisone in bulk and pharmaceutical formulations.

MATERIALS AND METHODS

Instrument

A Shimadzu UV/VIS double beam spectrophotometer model 1700, with matched quartz cells corresponding to 1 cm path length and spectral bandwidth of 2 nm.

Materials

Standard gift sample of Tolperisone Hydrochloride was procured from Emcure Pharmaceuticals Ltd. Tablets of 50 mg strength were procured from local pharmacy.

Solvent used

Methanol AR grade and distilled water (1:3 ratio) were used as a solvent in the study.

Stock solution

Accurately about 10 mg of the pure drug was weighed and dissolved in 25 ml methanol and the volume was made up to 100 ml with distilled water to give standard stock solution (100 µg/ml).

Method A:

Aliquots of standard stock solution were pipetted out and suitably diluted with distilled water to get the final concentration of 5, 10, 15, 20 up to 40 µg/ml of standard solutions. The solutions were scanned in the spectrum mode from 400 nm to 200 nm wavelength range and the zero order derivative spectra were obtained (Fig.1). The maximum absorbance of TOL was observed at 260.0 nm. The drug followed the Beer-Lambert's law in the concentration range of 5-40 µg/ml. The calibration curve was plotted as absorbance against concentration of TOL. The coefficient of correlation (r), slope and intercept values of this method are given in Table I. The concentrations of sample solutions were determined from calibration curve.[15]

Method B:

The first order derivative spectra at n=1 showed a sharp peak at 247.0 nm (Fig. 2).The absorbance difference at n=1 (dA/dl) was calculated by the inbuilt software of the instrument which was directly proportional to the concentration of the standard solution. The standard drug solutions were scanned in the first order derivative spectra. A calibration curve was plotted taking the absorbance difference (dA/dl) against the concentration of TOL. The coefficient of correlation (r), slope and intercept values of this method are given in Table I. The method was applied for determination of concentration of sample solution.

Method C:

The AUC (Area under curve) method involves the calculation of integrated value of absorbance with respect to the wavelength between two selected wavelengths 271 and 250. Area calculation processing item calculates the area bound by the curve and the horizontal axis. The horizontal axis is selected by entering the wavelength range over which the area has to be calculated. This wavelength range is selected on the basis of repeated observations so as to get the linearity between area under curve and concentration. Suitable dilutions of standard stock solution (100 µg/ml) of TOL were prepared and scanned in the spectrum mode from the wavelength range 400 nm to 200 nm (Fig. 3) and the calibration curve was plotted as AUC against concentration of TOL. The method was checked by analyzing the samples with known concentration. As the results obtained were satisfactory the method was applied for pharmaceutical formulation.

Analysis of tablet formulation

For estimation of Tolperisone Hydrochloride in tablet formulation by all the methods, twenty tablets were weighed and triturated to the fine powder. Tablet powder equivalent to 10 mg of TOL was weighed and dissolved in 25 ml methanol and further diluted with distilled water. It was kept for ultrasonication for 45 min. Finally, the volume was made up to the mark with distilled water; it was filtered through Whatmann filter paper no. 41 to get tablet stock solution of concentration 100 µg/ml. Various dilutions of tablet stock solution were prepared and analyzed for six times by all three methods and concentrations of TOL in tablet formulation T1 were calculated by all three methods (Table II). All these methods were validated according to ICH guidelines. Recovery studies were carried out at three different levels i.e. 80 %, 100 % and 120 % by adding the pure drug (8 mg,10 mg and 12 mg respectively) to previously analyzed tablet powder sample (10 mg) as per ICH guidelines. Percentage recovery was calculated as shown in Table III. All the methods A, B and C were validated for linearity, accuracy and specificity.[15]

RESULTS AND DISCUSSION

All methods A, B and C for the estimation of Tolperisone Hydrochloride in tablet dosage form were found to be simple, accurate, specific and reproducible. Beer-Lambert's law was obeyed in the concentration range of 5-40 µg/ml in all the methods. The values of standard deviation were satisfactory low and the recovery studies were close to 100%. TOL showed a broad spectrum, the derivative spectroscopy method applied has the advantage that it locates the hidden peaks in the normal spectrum when the spectrum is not sharp and it also eliminates the interference caused by the excipients present in the formulation. The AUC method has advantage that it is applicable to be drug which shows the broad spectra without a sharp peak. Hence these methods can be useful in the routine analysis of TOL in bulk drug and formulations.

Table I: Optical characteristics and other parameters.

Parameters	Method A	Method B	Method C
λ Max (nm)	260	247	250-271
Beer- Lambert's range (µg /ml)	5-40	5-40	5-40
Coefficient of correlation (r^2)	0.9984	0.9986	0.9990
Regression equation Y = mx + c a. Slope (m) b. Intercept (c)	 0.0673 0.000	 0.0037 0.000	 1.3830 0.130
LOD LOQ	0.196 0.594	0.2675 0.8108	0.004 0.012
Molar Absorptivity	1.61 X 10^6	9.5690 X 10^8	-----

Where, x is concentration in µg/ml and Y is absorbance unit.
A is Zero order derivative spectrum method with n = 0.
B is First order Derivative spectrum method with n = 1.
C is the AUC method.

Table II: Estimation of Tolperisone HCl in tablet formulation

Method	Tablet	Label Claim (mg)	Amount Found (mg)	%Mean*	S.D.	C.O.V.	S.E.
A	T_1	50	49.92	99.84	0.2375	0.2378	0.0969
B	T_1	50	49.88	99.77	0.2988	0.2994	0.1220
C	T_1	50	49.93	99.87	0.2762	0.2765	0.1127

Where, T1 (Rilutek) is brand of tablet formulation.
* Mean of six estimations (n=6).

eISSN: 2278 – 8700

Table III: Recovery study data

Method	Tablet Sample	Type of Recovery (%)	%Mean*	S.D.	C.O.V.	S.E.
A	T_1	80	99.90	0.5657	0.5662	0.3266
	T_1	100	99.88	0.3686	0.3690	0.2128
	T_1	120	99.75	0.5008	0.5020	0.2892
B	T_1	80	100.03	0.5687	0.5685	0.3283
	T_1	100	99.86	0.4041	0.4046	0.2333
	T_1	120	99.90	0.5056	0.5061	0.2991
C	T_1	80	99.52	0.7214	0.7248	0.4165
	T_1	100	99.73	0.5132	0.5145	0.2963
	T_1	120	99.55	0.2055	0.2064	0.1186

* Mean of six estimations (n=6)

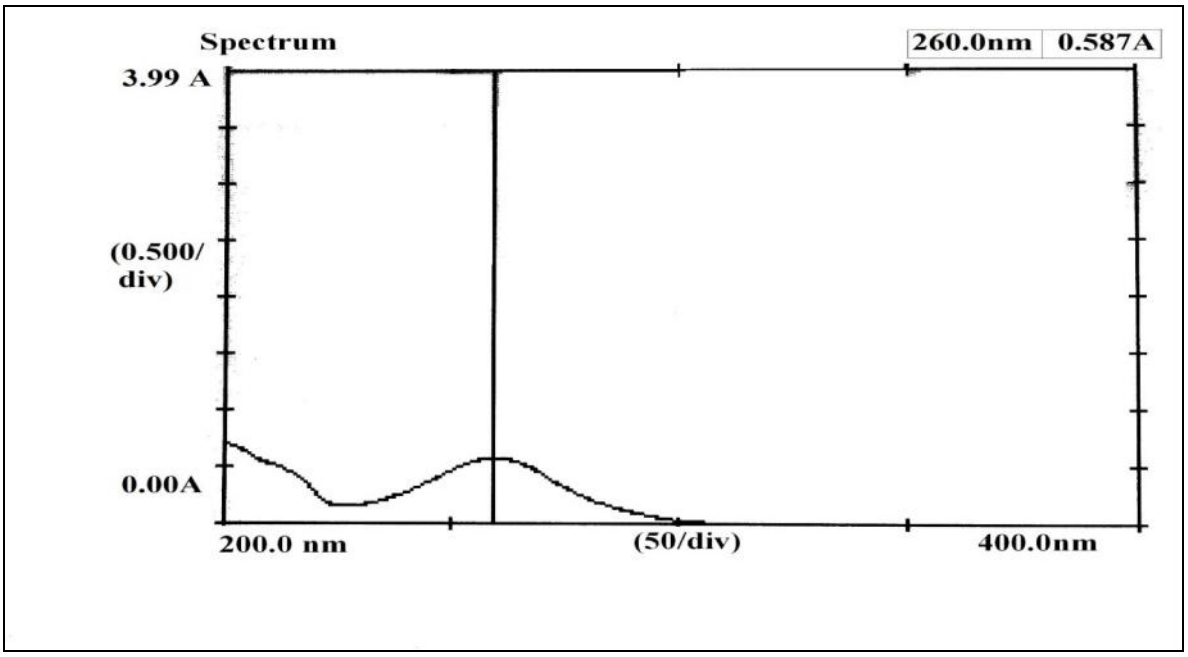

Fig. 1: Zero- order Derivative spectrum of Tolperisone

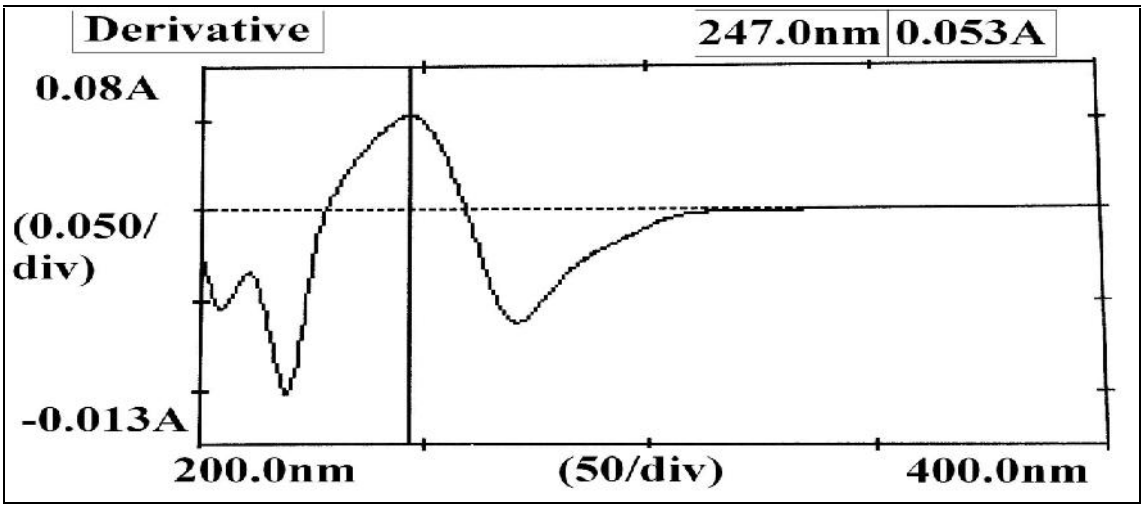

Fig. 2: First order derivative spectrum of Tolperisone.

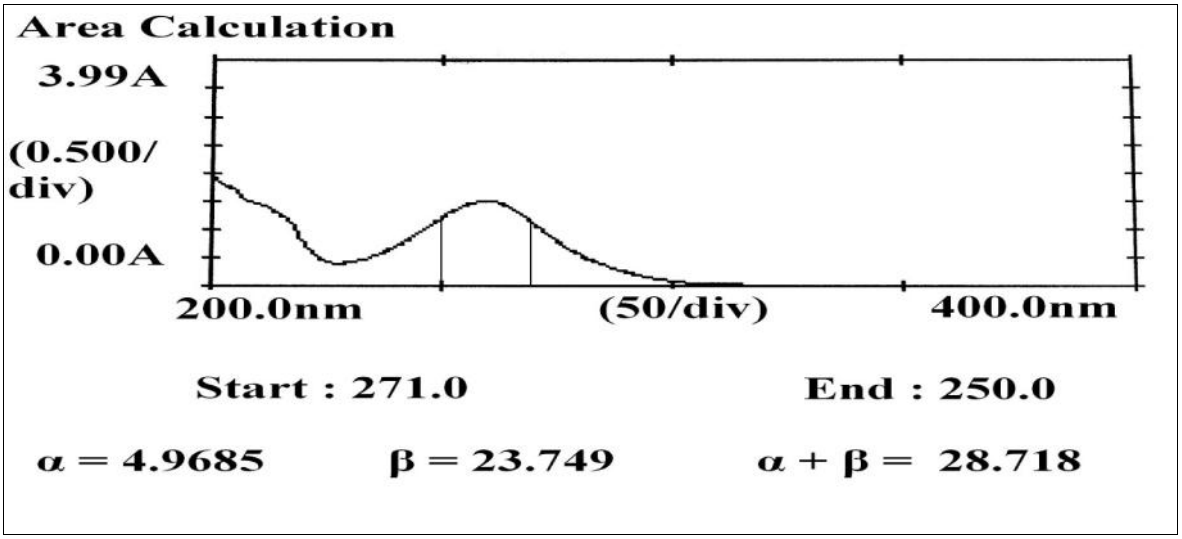

Fig. 3: Area under curve of Tolperisone.

ACKNOWLEDGEMENT

The authors are thankful to Emcure Pharmaceuticals Ltd. for supplying gift sample of Tolperisone Hydrochloride and to Principal, Dr. D. Y. Patil College of Pharmacy, Pune, for providing excellent research facilities.

REFERENCES

1. Sweetman SC: Martindale, The extra pharmacopoeia, The complete drug Reference. 36th Ed., The Pharmaceutical Press, London, 2009, 36: 44, 1899.
2. Budhwari S: The Merck Index, Merck Research Laboratories, Whitehouse Station, New Jerse. 2001, 13: 542, 9596.
3. Koladia BB, Vagela VM, UV spectrophotometric Method: A Quantitative estimation of Tolperisone hydrochloride in bulk and pharmaceutical dosage form. Int. J. Pharm. Tech. Research. 2012, 4: 1317-1322.
4. Praveen P, Jagathi V, Rao G, Spectrophotometric determination of Tolperisone using 2, 4-dinitrophenylhydrazine reagent. Inter J Res Pharm Sci. 2010, 1: 317-320.
5. Jagathi V, Shaiba M, Raghavi K, Assay of Tolperisone by extractive spectrophotometry. Res. J. Pharm. Bio. Chem. Sci. 2010, 3: 654–657.

6. Nimila IC, Chiranjeevi N, Maheswari VU, Method development and statistical validation of UV spectrophotometric method for Tolperisone hydrochloride in bulk and tablet dosage form. J. Pharm. Res. 2011, 4: 1356–1357.
7. Murali M, Satyanarayana PV, Simple validated isocratic RP –HPLC method for estimation of Tolperisone in bulk and pharmaceutical dosage form. Der Pharma Chemica. 2011, 3: 13–19.
8. Bae JW, Park YS, Sohn UD, HPLC determination of Tolperisone in human Plasma. Arch Pharm Res. 2006, 29: 339–342.
9. Murakami T, Konno H, N. Fukutsu N, Identification of a degradation product in stressed tablets of Tolperisone hydrochloride by the complementary use of HPLC hyphenated techniques, J Pharm Biomed Anal. 2008, 47: 553-559.
10. Thummala Veera RR, Raja Kumar S, Srinivas A, Development and validation of a precise, single HPLC method for the determination of Tolperisone impurities in API and pharmaceutical dosage forms. Sci. Pharma. 2013, 81: 123–138.
11. Liwruangrath S, HPTLC determination of Tolperisone hydrochloride. J Pharm Biomed Anal. 1999, 20: 401-404.
12. Chhalotiya UK, Bhatt KK, Shah DA, Estimation of centrally acting muscle relaxant drug Tolperisone hydrochloride using HPTLC method. World J Analytical Chemistry. 2013, 1: 1-7.
13. Sharma KK, First derivative spectroscopic method for simultaneous estimation of Paracetamol and Tolperisone in their combined dosage form. J Pharm Sci Bio Res. 2012,2: 92-96.
14. Liawruangrath S, Liawruangrath B, Pinole P, Simultaneous determination of Tolperisone and Lidocaine by high performance liquid chromatography. J Pharm Biomed Anal. 2001,26: 865-872.
15. Chan CC, Analytical Method Validation and Instrument Performance Verification, Wiley Interscience, 2004, 16-22.