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UV-Visible spectrophotometric method for the determination of lacosamide in its pure and tablet dosage form

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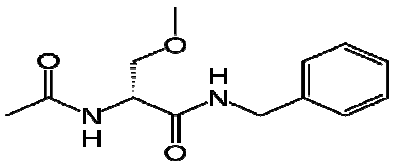
ABSTRACT

An accurate, rapid, highly sensitive, economic and reproducible UV-Visible spectrophotometric method was developed and validated for the estimation of Lacosamide in bulk its pharmaceutical formulation. The method was validated as per International Conference on Hormonozation (ICH) Q2A and Q2B guidelines. The Lacosamide was monitored at 215 nm with UV detection; there is no interference of diluents at 215 nm for Lacosamide. The method was linear (r^2 =0.999) at concentration ranging from 5-30 µg mL^{-1}, precise (intra and inter-day %RSD values <2%), accurate (mean recovery=101.3%) specific and robust. The proposed method was successfully applied for the quantification of bulk and active pharmaceutical present in tablet dosage form.

Key words: Lacosamide, UV-Visible spectrophotometry, validation.

INTRODUCTION

Lacosamide tablets are indicated as adjunctive therapy in the treatment of partial-onset seizures in patients with epilepsy aged 17 years and older [1-2]. The chemical name of Lacosamide is the single (R)-enantiomer, is (R)-2-acetamido-N-benzyl-3methoxypropionamide (IUPAC). Lacosamide is a functionalized amino acid. Its molecular formula is C13H18N2O3 and its molecular weight is 250.30.Lacosamide is a white to light yellow powder. It is sparingly soluble in water and slightly soluble in acetonitrile and ethanol. It is not official in any pharmacopoeia, few liquid chromatography methods have been reported for the determination of Lacosamide [3-8].The author have developed a spectrophotometric method which would serve as a rapid and reliable method for the determination of Lacosamide in Bulk and pharmaceutical dosage forms. The statistical analysis proved that the method is reproducible and selective for the analysis of lacosamide in bulk drug and tablet formulation.



Lacosamide

MATERIALS AND METHODS

Instrumentation:
The analysis of the drug was carried out on UV WIN 5.0 software in T60U spectrophotometer (Make: PG instrument limited). Weighing was done on digital electronic balance made by DENVER instruments.

Chemicals and reagents:
Milli-Q water (Millipore Corporation, USA) was used and Methanol was purchased from Merck (Mumbai, India). Potassium dihydrogen phosphate, sodium hydroxide, hydrochloric acid. Lacosmaide drug was obtained as a gift from local manufacturing unit Hyderabad.

Preparation of standard solution:
The standard lacosamide (5mg) was weighed accurately and transferred to volumetric flask (5 ml) was dissolved properly and sonicated and made up to the mark with milli-Q water.

Preparation of test solution:
For the estimation of lacosamide in tablets formulation, 20 tablets were weighed and triturated to fine powder. Weigh accurately weight equivalent to 50mg of lacosamide powder and transferred to 50 ml of volumetric flask. Then it was dissolved and further diluted with milli-Q water up to the mark. It was ultra-sonificated for about 30 min, and was filtered through Whatmann filter paper No.41 and final dilution was made with milli-Q water so as to get final volume to 20 µg/ml.

Validation:
The objective of method validation is to demonstrate that the method is suitable for its intended purpose as it is stated in ICH guidelines [9-11] Q2A & Q2B. Recommended validation characteristics depend on the type of analytical procedure. Method validation characteristics were tested in accordance with ICH guidelines for each method [10]. Linearity (correlation coefficient) was tested in the given range for each method. Repeatability and intermediate precisions were obtained as % Relative Standard Deviation (% RSD) using six replicates per day. Limits of detection and quantification were provided for Lacosamide using standard deviation of intercept. To establish ruggedness of the proposed methods, assay for Lacosamide was performed at 215 nm. The polynomial regression data for the calibration plots showed good linear relationship in the concentration range of 5-30 µg/ml and given in table1. Recovery studies were carried out at three different levels i.e. 50%, 100%, and 150% by adding the pure drug to the previously analyzed tablet powder sample. Percentage recovery for Lacosamide was determined by all the methods and they were found to be under acceptance criteria which are 101.6%, 101.6%, and 100.7% according ICH guidelines. The percentage recovery value indicates non interferon from excipients used in formulation. The result of analysis of marketed formulation is shown in table3. The reproducibility and accuracy of the method was found to be good, which was evidenced by low standard deviation.

Linearity:
The Linearity for spectrophotometric method was determined at five concentration levels ranging from 5-30 µg mL^{-1} for Lacosamide. The calibration curve was constructed by plotting absorbance against concentration of drug. The slope and intercept value for calibration curve were y=0.026 X +0.079, were y represents absorbance of analyte and X represents analyte concentration. The results were satisfactory, because there is significant correlation between absorbance and concentration of drug within the concentration range. The calibration curves for Lacosamide are given in the figure4.

Precision:
The precisions of the analytical method were determined by repeatability (within-day) and Intermediate precision (between-day). The concentration (20 µg mL^{-1}) for Lacosamide was analyzed six times in one day for within-day precision and once daily for three days for between-day precision. The intraday and interday precision showed a coefficient of variation ranged from 0.074% to 0.738% and from 0.171% to 0.248% respectively for Lacosamide. The results are shown in Table2.and indicate that the method is precise.

Recovery:
Recovery was determined by spiking the formulation with standards of drug equivalent to 50%, 100% and 150% of the amount originally present. The percentage of drug found in formulation, mean, standard deviation in formulation

were calculated and given in Table3. The results of recovery analysis were found to be 30.49 ± 0.390 to 50.35 ± 0.390 and reported in the Table3. The results of analysis showed that the amount of drug found was in good agreement with the label claim of formulation.

Table1: concentration levels for linearity curve of lacosamide.

Conc.(µg/ml)	Absorbance
5	0.221
10	0.34
15	0.484
20	0.608
25	0.749
30	0.879

Table2: Precision of the Method

Drug	Conc. (µg/mL)	Measured Conc. (µg/mL)		% CV	
		Intra-day	Inter-day	Intra-day	Inter-day
Lacosamide	20	20.23 ± 0.015	20.42 ± 0.035	0.074	0.171
		20.19 ± 0.026	20.34 ± 0.045	0.128	0.221
		20.15 ± 0.042	20.42 ± 0.036	0.208	0.176
		20.15 ± 0.020	20.34 ± 0.042	0.099	0.206
		20.42 ± 0.0513	20.20 ±0.05	0.252	0.248
		20.34 ± 0.15	20.18 ± 0.04	0.738	0.198

Table3: Results of accuracy/Recovery studies

Analyte	Amount(%) of drug added to the analyte	Theoretical conc. (µg/mL)	Measured conc. (µg/mL) ± SD	% Recovery	% RSD
Lacosamide	50	30	30.49 ± 0.390	101.6	1.27
	100	40	40.64 ± 0.150	101.6	0.369
	150	50	50.35 ± 0.390	100.7	0.774

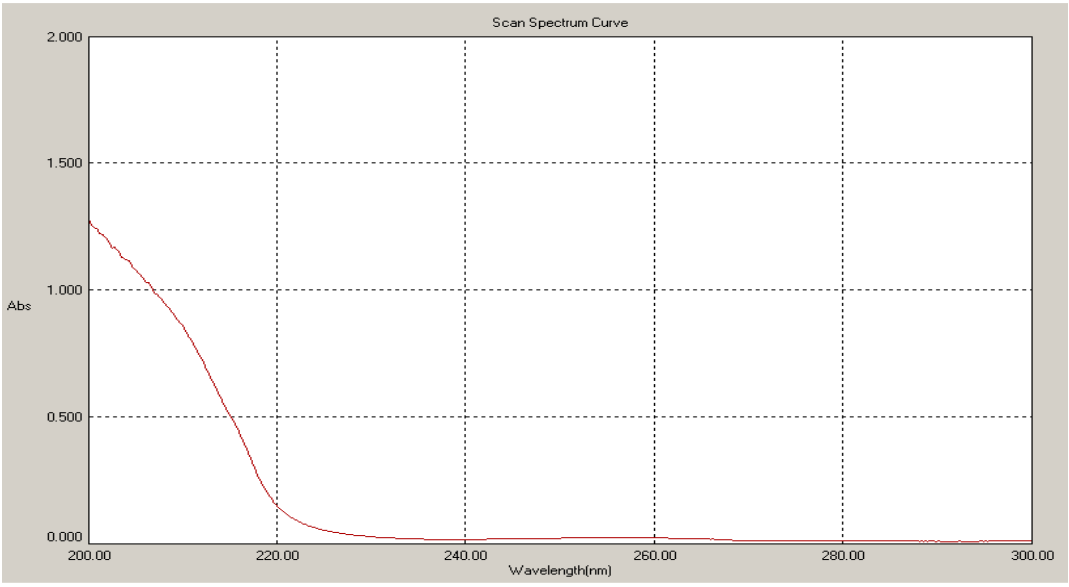


Figure1: Showing assay spectrum of lacosamide tablet formulation (Vimpat 50mg).

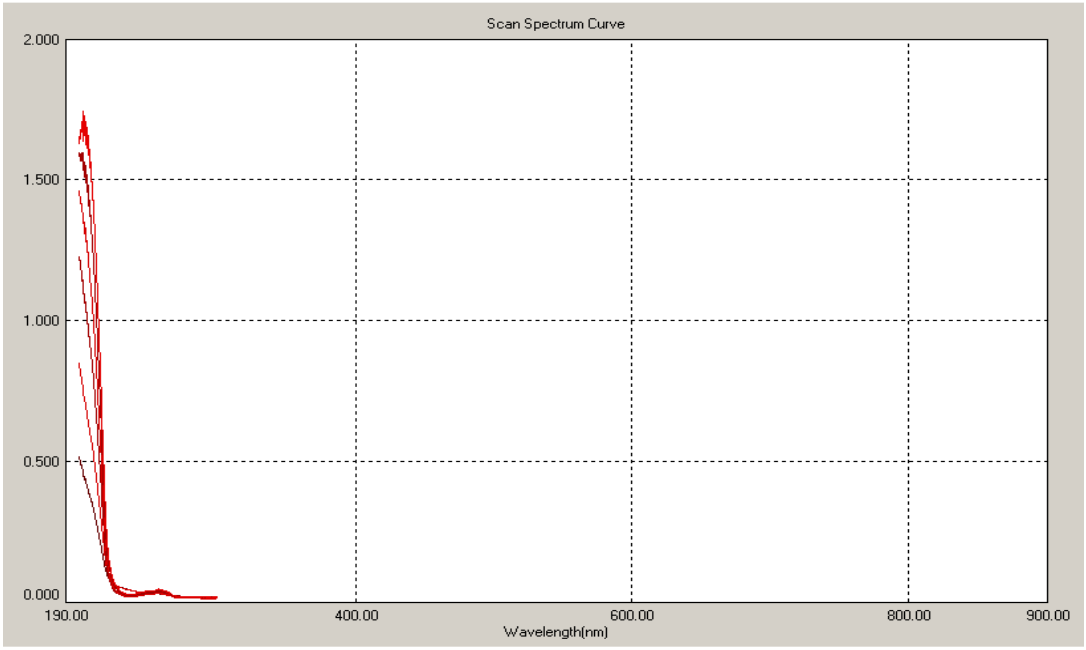


Figure2: showing spectra of linearity in the concentration range of 5-30 µg/ml.

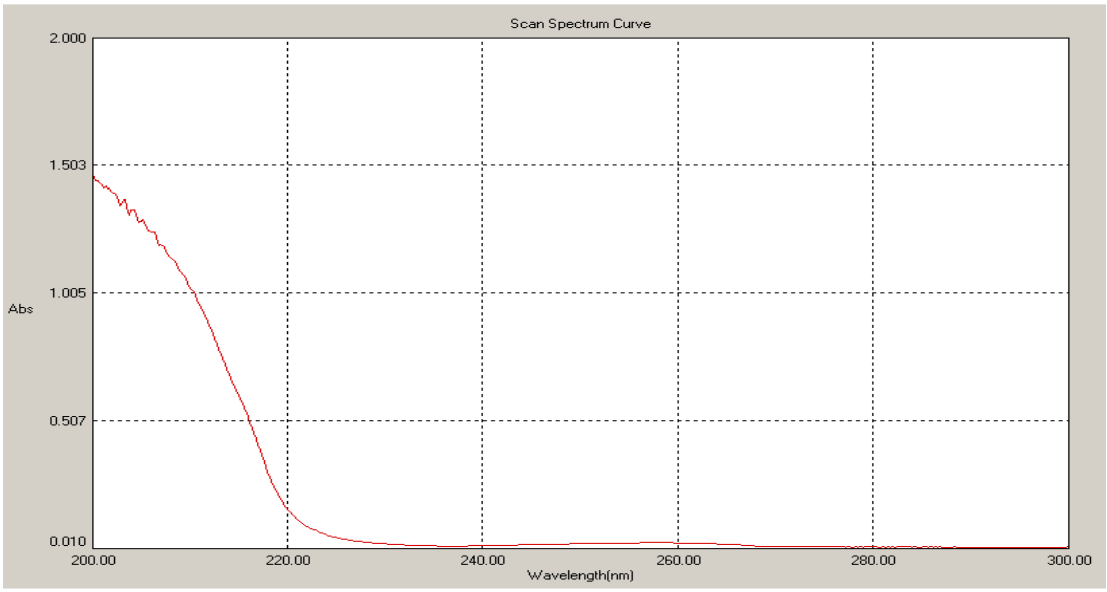


Figure3: Showing spectrum of 20 µg/ml concentration selected for inter and intra-day precision.

Table 4. UV PARAMETERS

Parameters	Drug (LACOSAMIDE)
Linearity range	5-30 µg mL^{-1}
Equation of regression	y=0.026x + 0.079
Correlation coefficient (R^2)	0.999
Precision (% RSD) Intra-day precision Inter-day precision	 0.6055% 0.6085%
Accuracy	101.3%
Limit of detection (LOD)	1.358 µg mL^{-1}
Limit of quantification (LOQ)	4.118 µg mL^{-1}

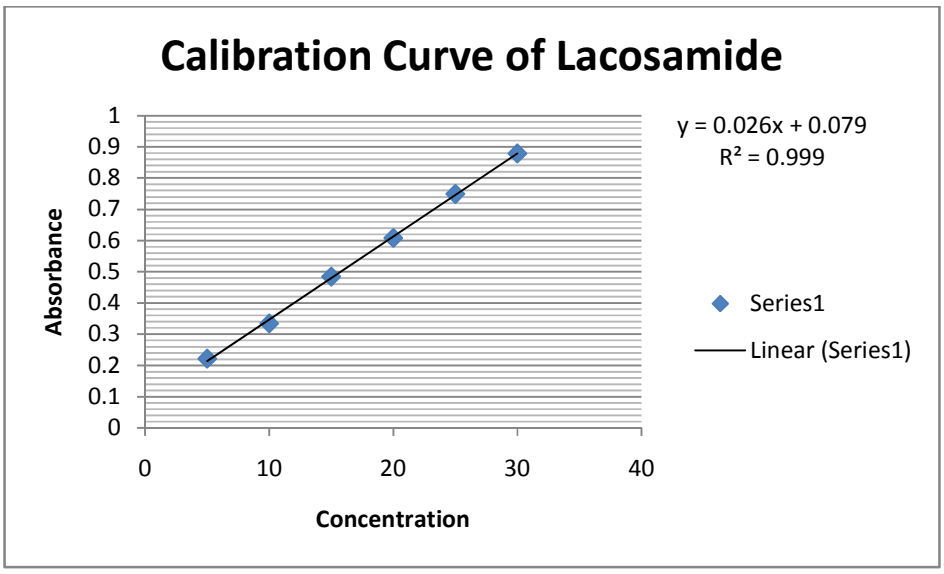


Figure4: showing calibration curve of lacosamide(5-30 µg/ml).

CONCLUSION

The proposed method is rapid, accurate, precise and reproducible and hence can be used for routine analysis of Lacosamide in bulk and tablet dosage forms. The sample recoveries from the formulation were in good agreement with their respective label claims, which suggested non-interference of excepients and blank in the estimation. The most striking features of the method is its simplicity and rapidity not requiring tedious sample preparations such as extraction of solvents, heating, degassing which are may needed for HPLC procedures and getting the results meeting all requirements. All the above results indicate that, the method employed here is very simple, accurate, economic and rapid for routine analysis of Lacosamide.

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