Int. J. Chem. Sci.: 9(1), 2011, 52-58
ISSN 0972-768X

DEVELOPMENT AND VALIDATION OF SPECTROPHOTOMETRIC METHOD FOR THE ESTIMATION OF VENLAFAXINE IN BULK AND FORMULATIONS

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ABSTRACT

A simple, sensitive and reproducible spectrophotometric method for the analysis of venlafaxine in pure form and in pharmaceutical formulations has been developed. Venlafaxine is a synthetic novel anti-depressant drug, which acts by inhibiting the reuptake of serotonin and noradrenaline. Venlafaxine exhibited maximum absorbance at 222 nm with an apparent molar absorptivity of 1.2399 x 10^5. Beer's law was obeyed in the concentration range of 2-26 μg/mL. Results of the analysis were validated statistically and by recovery studies. This method is successfully employed for the determination of venlafaxine in various pharmaceutical preparations.

Key words: Venlafaxine, Spectrophotometric method, Beer's law.

INTRODUCTION

Venlafaxine is an example of synthetic novel anti-depressant[1] drug, which acts by inhibiting the reuptake of serotonin and noradrenaline.[2] It is chemically 1-[(1 RS)-2-(dimethyl amino)-1-(4-methoxy phenyl) ethyl] cyclohexanol hydrochloride.[3] It is official in European Pharmacopoeia[4]. A few analytical methods have been reported for its quantitative estimation in pharmaceutical formulations, which includes few HPLC methods[5-10] and spectrophotometric methods.[11,12]

In view of this fact, some simple analytical methods are needed for its quantitative

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estimation. The objective of the present work was to develop a simple spectrophotometric method with greater precision and accuracy that can be used for the routine Q. C. analysis of the formulations containing venlafaxine. In this method, the drug was dissolved in phosphate buffer of pH 6.8, and then the absorbance was measured at 222 nm.

EXPERIMENTAL

Materials and methods

Absorbance of the solutions was measured with Systronics UV-Visible spectrophotometer 117 Model with resolution of 0.1 nm, wavelength accuracy of ± 1 nm and spectral band width of ± 2 nm. All chemicals and solvents were of analytical grade and procured from Merck Speciality Pvt. Ltd., Mumbai.

Standard and sample solution of venlafaxine

About 10 mg of venlafaxine (bulk or formulation) was weighed accurately and dissolved in 100 mL of phosphate buffer of pH 6.8 in a volumetric flask to give a stock solution having 0.1 mg/mL concentration. Aliquots of stock solution were suitably diluted with buffer to give final concentrations of 2-26 μg/mL. The absorbance of the diluted solutions was measured at 222 nm against blank.

Assay procedure

Three commercial brands of venlafaxine were procured e.g. Dalium (Nicholas) containing label claim of 25, 75 mg and Veniz XR (Sun Pharma) having 37.5, 75 mg and third brand Venlift OD has 37.5, 75 mg of venlafaxine. 20 Tablets of first brand was weighed and ground to fine powder. Tablet powder equivalent to 10 mg of drug was transferred to 100 mL volumetric flask. It was dissolved and made up to mark with buffer. The solution was filtered through Whatmann filter paper No. 41 and it is suitably diluted to obtain a solution having concentration of 10 μg/mL. For estimation of drug concentration from capsules, gelatin shells were removed and amount of powder equivalent to 10 mg of drug was taken and the above procedure is repeated to produce the concentration of 10 μg/mL and prepared solutions were analyzed by method described. The amount of venlafaxine was computed from the calibration curve (Fig. 2).

Determination of venlafaxine in the presence of additives

10 mg of venlafaxine and starch (tablet additive) were taken in a 100 mL volumetric

flask. It was dissolved and made up to the mark with buffer, filtered and the drug content was estimated in a similar manner as given in the assay procedure. The same method as mentioned above was adapted to other commonly used tablet additives such as lactose and poly vinyl pyrrolidine k 30.

RESULTS AND DISCUSSION

In the proposed method, venlafaxine showed absorption maxima at 222 nm. The calibration curve was found to be linear in the concentration range of 1.0 to 26.0 µg/mL. The optical characteristics such as absorption maxima, Beer's law limits, molar absorptivity and Sandell's sensitivity are presented in Table 1. The regression analysis using method of least squares was made for the slope (b), intercept (a) and correlation coefficient (r^2) was obtained from different concentrations The results are summarized in Table 1. U.V Spectrum and calibration curve of venlafaxine are shown in Figs. 1 and 2, respectively.

Table 1: Optical characteristics, precision and accuracy of proposed method

Parameter	Method
Absorption maxima (λ max) nm	222.0
Beer's law limit (µg/mL)	1-26
Sandell's sensitivity (µg/cm^2/0.001 abs. Units)	0.5455
Molar absorptivity (litre.mole^{-1}.cm^{-1})	1.2399 x 10^5
Correlation coefficient (r^2)	0.9999
Regression equation (Y)*	Y = 0.0094 + 0.0339 X
Slope (b)	0.0339
Intercept (a)	0.0094
% RSD**	0.5455
Standard error**	0.0733

*Indicates Y = a + b X when Y is absorbance and X is the concentration of venlafaxine (µg/mL).

**denotes for six replicates

The percent relative standard deviation and standard error calculated from the six replicate samples containing known amounts of the drug and the results are also given in Table 1.

To evaluate the accuracy and reproducibility of the proposed method, known amounts of pure drug were added to the previously analyzed pharmaceutical preparations and the mixtures were analyzed by the proposed method. The percent recoveries are given in Table 2.

Table 2: Estimation of venlafaxine in pharmaceutical formulations

Name of the tablet/capsule	Claim as per label (mg)	Amount estimated (mg)	% label claim ± S.D*	Standard error
Dalium tab	25	24.82	99.28 ± 0.08	0.0357
	75	75.2	100.2 ± 0.01	0.0044
Veniz XR cap	37.5	36.96	99.56 ± 0.05	0.0223
	150	150.1	100.0 ± 0.02	0.0089
Venlift OD cap	37.5	37.6	100.26 ± 0.07	0.0313
	75	74.8	99.73 ± 0.03	0.0134

*Mean of three replicates

Table 3: Recovery studies

Amount of drug taken from tablets (mg)	Amount of standard drug added (mg)	Amount found* (mg)	% Recovery ± SD*	Standard error
50	10	60.08	100.1 ± 0.05	0.0223
100	20	119.42	99.33 ± 0.04	0.0178
150	30	180.4	100.2 ± 0.02	0.0089

*Mean of five replicates

Studies undertaken using tablet additives such as lactose, starch and PVP K 30 indicate that they did not interfere with estimation of venlafaxine by the proposed method.

Thus, the proposed method is simple and sensitive with reasonable precision and accuracy. This can be used for the routine determination of venlafaxine in Q. C. analysis.

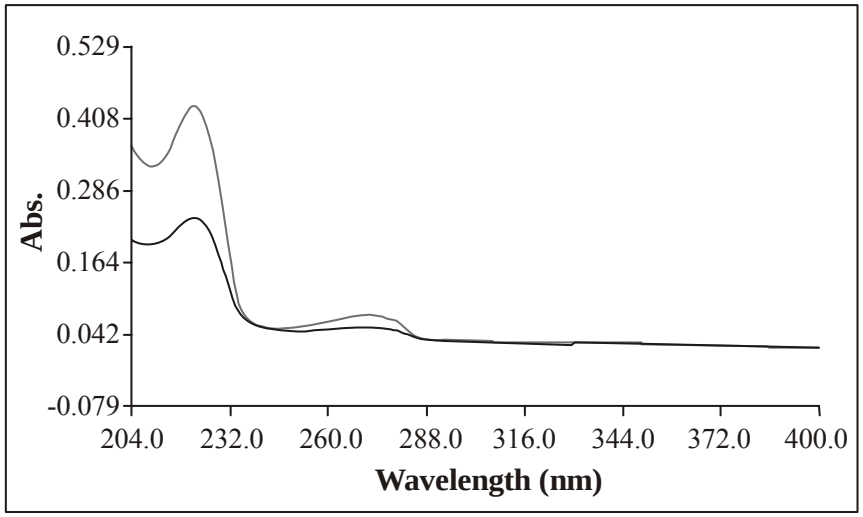

Fig 1: U.V spectrum of venlafaxine in phosphate buffer of pH 6.8

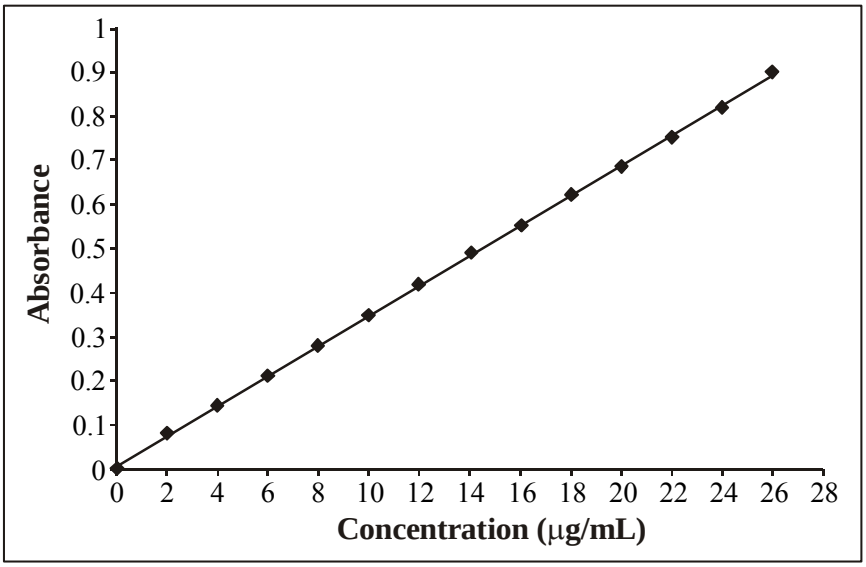

Fig. 2: Calibration curve for the estimation of venlafaxine

ACKNOWLEDGEMENTS

The authors are thankful to Dr. Reddy's Laboratories, Hyderabad, India for providing pure gift sample of venlafaxine to carry out this work.

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Accepted : 17.08.2010