Asian Journal of Chemistry Vol. 21, No. 9 (2009), 6763-6766

Analytical Procedures for Determination of Paroxetine in Pharmaceutical Formulations

SHECHINAH FELICE CHORAGUDI*, V.S. SETTALURI, SHILVA KAYASTHA, PRATHYUSHA DEVATHU and UJJWALA KROTHAPALLI
Department of Biotechnology, Koneru Lakshmaiah College of Engineering, Vaddeswaram-522 502, India
E-mail: shechinahfelice@yahoo.co.in; shilva_kay@hotmail.com

Sophisticated analytical methods *viz.*, HPLC and HPTLC which are employed for analysis of drugs are relatively expensive for the utilization by small scale industries. Hence need for simple analytical methods arises, which are suggested in the proposed methods for routine determination of paroxetine in pharmaceutical formulations and bulk dosage forms.These methods are based on the formation of coloured species on binding of paroxetine with potassium ferricyanide and ferric chloride reagent to produce a greenish yellow coloured chromogen (λ_{max} at 710) for **method A** and sodium nitrite and conc. HCl to produce a pale yellow coloured chromogen (λ_{max} at 490) for **method B**. Results of analysis were validated statistically and by recovery studies. Based on the principle of absorption visible spectrophotmetry and the results obtained the methods could be treated as simple, sensitive and reproducible for the determination of paroxetine in pharmaceutical formulations.

Key Words: Paroxetine, Spectrophotometry, Molar abosrptivity, Beer's law.

INTRODUCTION

Paroxetine chemically is (3S,4R)-3-([benzo[1,3]dioxol-5-yloxymethyl)-4-(4-fluorophenyl)piperidine is a phenylpiperidine derivative which is chemically unrelated to the tricyclic or tetracyclic antidepressants and is used for the treatment of panic attacks that is marketed under trade names such as paradise, paxil, paxil CR and pexeva (GSK). It is one of the most commonly used antidepressant for the treatment of the symptoms of depression, obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), panic disorder, generalized anxiety disorder (GAD), social phobia/social anxiety disorder and premenstrual dysphoric disorder (PMDD). Only a few methods *viz.*, Liqiud chromatography coupled to tandem mass spectrometry, HPLC[1-5], LC-MS[6], gas chromatography-mass spectrometry[7], high performance liquid chromatography-electrospray ionization mass spectrometry (HPLC-MS/ESI)[8] appeared in the literature for the determination of paroxetine in bulk and pharmaceutical formulations. As the drug has recently come into existence, the number of available procedures that could be of utility in quality control analysis are less and hence the author has proposed these methods for the routine analysis of paroxetine in pharmaceutical formulation.

EXPERIMENTAL

After due calibration of the instrument, spectral and absorbance measurements are made using ELICO UV-Visible spectrophotometer model SL-159, Mumbai, India.

All the chemicals used were of analytical grade. All the solutions were freshly prepared with double distilled water. Freshly prepared solutions were used for analysis. In the proposed methods aqueous solutions of potassium ferricyanide (0.5 % w/v), ferric chloride (0.1 N) and conc. HCl were used for **method A** and sodium nitrite (10 % w/v) and conc. HCl were used for **method B**.

Standard and sample solution of paroxetine: About 100 mg of paroxetine (formulation) was accurately weighed on a digital single pan balance and dissolved in 100 mL of double distilled water in a volumetric flask to prepare a solution with concentration equal to 1 mg/mL standard solution and further dilutions were made to obtain a solution of 100 µg/mL for **method A** and **method B**.

Assay procedure

Method A: Aliquots 0.2-1.0 mL of standard drug solution (100 µg/mL) was transferred into a series of graduated tubes. To each tube 2 mL of potassium ferricyanide solution was added followed by 0.5 mL of 0.1 N ferric chloride and 0.5 mL of conc. HCl. The wavelengths were scanned in the range of 630 to 730 nm and the final absorbance of the greenish yellow coloured chromogen was found to be 710 nm.

Method B: Aliquots 1-5 mL of standard paroxetine solution (100 µg/mL) was transferred into a series of 10 mL graduated tubes. To each tube 2 mL of sodium nitrite solution was added followed by 1 mL of conc. HCl solution. The wavelengths were scanned in the range of 450 to 550 nm and the final absorbance of the pale yellow coloured chromogen was found to be 490 nm.

The amount of paroxetine was computed from the calibration curve. Beers law plots of paroxetine for **methods A** and **B** are given in Figs. 1 and 2.

RESULTS AND DISCUSSION

The results of analysis for **methods A** and **B** were validated through systematic statistical analysis and results are tabulated. The statistical analysis values are reported in Table-1 and assay and recovery results for these methods are tabulated in Table-2.

Method A: The proposed method is based on the mechanism of oxidation followed by complex formation, where in the initial reaction the drug undergoes oxidation in the presence of ferric chloride and then the oxidized drug reacts with potassium ferricyanide to forms a greenish yellow coloured complex which exbhibits maximum absorption at wavelength of 710 nm.

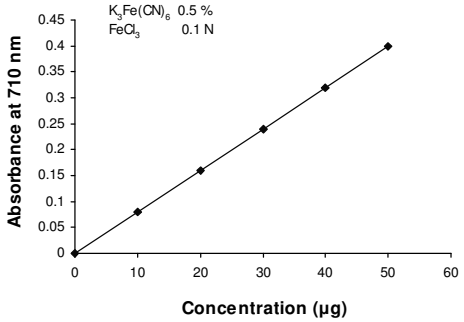

Fig. 1 Beer's laws plot of paroxetine: **method-A** 730 nm

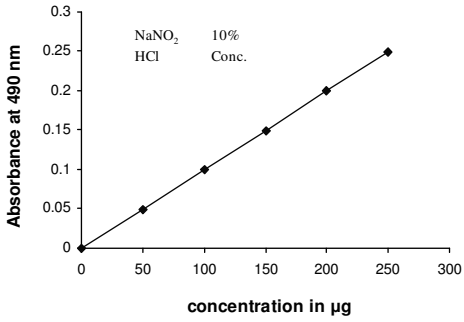

Fig. 2. Beer's laws plot of paroxetine: **method-B** 490 nm

TABLE-1
OPTICAL CHARACTERISTICS, PRECISION AND ACCURACY OF THE PROPOSED METHOD

Parameter	**Method A**	**Method B**
λ_{max} (nm)	710	490
Beer's law limit (µg/mL)	10-50	10-50
Sandell's Sensitivity (?g/cm^2/0.001 abs. unit)	0.0345	0.0284
Molar absorptivity (L mol^{-1} cm^{-1})	1.08×10^4	1.31×10^4
Correlation coefficient (r)	0.9904	0.9975
Regression Equation (Y)*		
Slope a	0.06860	0.95740
Intercept b	0.00134	0.00036
% RSD	0.96	0.25
Percent range of errors		
0.05 level of Significance	± 0.8106	± 0.2147
0.01 level of Significance	± 1.0028	± 0.2656

*Y = a + bx, where 'Y' is the absorbance and x is the concentration of paroxetine in µg/mL.
**For six replicates.

TABLE-2
ESTIMATION OF PAROXETINE IN PHARMACEUTICAL FORMULATIONS

Formulations	Labeled amount (mg/tablet)	% Recovery by proposed methods	
		Method A	**Method B**
Tablet 1	250	99.00	99.70
Tablet 2	250	99.20	99.44
Tablet 3	250	99.38	99.70
Tablet 4	250	100.20	100.10

Method B: The proposed method is based on the mechanism of diazotization in the presence of sodium nitrite and concentrated hydrochloric acid to form a pale yellow coloured chromogen that shows maximum absorption at a wavelength of 490 nm.

For these methods the optical characteristics such as absorption maxima, Beer's law limits, molar absorptivity and sandell's sensitivity, regression analysis using the methods of least squares, slope (a), intercept (b) and correlation coefficient (r) obtained from different concentrations are summarized in Table-1. The precision and accuracy were found by analyzing six replicate samples containing known amounts of the drug and the results are summarized in Table-1. The accuracy of these methods in the case of formulations were thoroughly studied by recovery experiments and the results were presented in Table-2. Additional checks on the accuracy of these methods were analyzed by adding known amounts of pure drug to pre-analyzed formulations.

Conclusion

Performance recovery experiments and per cent recovery values obtained indicated the absence of interferences from the commonly encountered pharmaceutical additives and excipients. Thus the proposed **methods A** and **B** for determination of paroxetine are simple and sensitive with reasonable precision and accuracy and can be used as standard methods for the routine determination of paroxetine in quality control analysis.

ACKNOWLEDGEMENT

The authors are grateful to the Management of Koneru Lakshmaiah College of Engineering, Vaddeswaram, Guntur Dist. for providing the necessary infrastructure facilities.

REFERENCES

1. O.H. Jhee, H.K. Seo, M.H. Lee, Y.C. Jeon, L.M. Shaw, S.H. Lee, Y. Hur, K.H. Kim, H.S. Lee, S.E. Lee and J.S. Kang, *Arzneimittel Forschung*, **57**, 455 (2007).
2. C. López-Calull and N. Dominguez, *J. Chromatogr. B, Biomed. Sci. Appl.*, **724**, 393 (1999).
3. J.G. Shin, K.A. Kim, Y.R. Yoon, I.J. Cha, Y.H. Kim and S.G. Shin, *J. Chromatogr. B, Biomed. Sci. Appl.*, **713**, 452 (1998).
4. L. Kristoffersen, A. Bugge, E. Lundanes and L. Slørdal, *J. Chromatogr. B, Biomed. Sci. Appl.*, **734**, 229 (1999).
5. H. Juan, Z. Zhiling and L. Huande, *J. Chromatogr. B, Anal. Technol. Biomed. Life Sci.*, **820**, 33 (2005).
6. P. Massaroti, N.M. Cassiano, L.F. Duarte, D.R. Campos, M.A. Marchioretto, G. Bernasconi, S. Calafatti, F.A. Barros, E.C. Meurer and J. Pedrazzoli, *J. Pharm. Pharm. Sci.*, **8**, 340 (2005).
7. C.B. Eap, G. Bouchoux, M. Amey, N. Cochard, L. Savary and P. Baumann, *J. Chromatogr. B, Anal. Technol. Biomed. Life Sci.*, **766**, 77 (2002).
8. Z. Zhu and L. Neirinck, *J. Chromatogr. B, Anal. Technol. Biomed. Life Sci.*, **780**, 295 (2002).

(*Received*: 1 September 2008; *Accepted*: 30 July 2009) AJC-7691