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Visible Spectrophotometric Method for the Determination of a Lipid lowering drug in Pharmaceutical Dosage forms

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A simple, sensitive and reproducible spectrophotmetric method is developed for the determination of Atorvastatin calcium in bulk and dosage forms. This method is based on the formation of colour species on binding of Atorvastatin calcium with potassium ferro cyanide and ferric chloride to produce pale green coloured solution (λ_{max} at 425 nm). Results of analysis were validated statistically and by recovery studies. This method is successfully employed for the determination of Atorvastatin calcium in various pharmaceutical preparations.

Keywords: Atorvastatin calcium, Visible Spectrophotometric determination, Beer's Law.

Atorvastatin calcium[1,2] (ATS) is an example of anti hyperlipoproteinemic drug widely used in the management of obesity. It is chemically (BR,SR)-2-(4-floro phenyl)-β,δ –di hydroxy –5-(1-methyl ethyl)-3-phenyl-4-[(phenyl amine) carbonyl]-1 H-pyrrole-1-heptanoic acid .It is useful in lowering blood LDL cholesterol by inhibiting HMG CoA reductase enzyme. A thorough survey of the literature revealed only few methods reported for the determination of ATS. They include HPLC[3] and extractive spectrophotometry[4]. The analytically useful functional groups of ATC have not been fully exploited. The authors have made attempts in this direction and succeeded in developing this visible spectrophotometric method. This method is based on the reaction of ATS with ferric nitrate and concentrated nitric acid to produce a pale green coloured chromogen.

Present study describes the development of a simple, sensitive spectrophotometric method for the routine quality control analysis of bulk dosage forms containing atorvastatin calcium in which the drug is treated with ferric chloride and potassium ferro cyanide to form pale green coloured chromogen.(λ_{max} at 425 nm)

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EXPERIMENTAL

Instrumentation

Spectral and absorbance measurements are made with Systronics UV-Visible Double beam Spectrophotometer model 2201.

Reagents

All the chemicals used were of analytical grade. All the solutions were freshly prepared with distilled water. Freshly prepared solution of ferric chloride(0.2 % w/v) and potassium ferro cyanide (5% w/v in distilled water) were used for this method.

Standard and Sample solution of Atorvastatin

About 100 mg of Atorvastatin calcium (bulk or formulation) was accurately weighed and dissolved in 100 ml of methanol in a volumetric

flask to make a solution of 1mg/ml standard solution. Further dilutions are made with distilled water only.

Assay procedure

Aliquots (0.4-2 ml) of standard Atorvastatin calcium solution (500 µg/ml) were transferred to a series of 10 ml graduated tubes and the volume is made up to 2 ml with distilled water. To each tube 2 ml of potassium ferro cyanide and 1 ml of ferric chloride added. The contents were mixed thoroughly and kept it at room temperature for 5 minutes. The absorbance of the coloured solution was measured at 425 nm against the reagent blank. The amount of Atorvastatin calcium was computed from the calibration curve.

RESULTS AND DISCUSSION

The proposed method was based on reaction of Atorvastatin calcium with potassium ferro cyanide and ferric chloride and based on the formation of pale green colored chromogen. This reaction is a typical example of schiff's base formation. The optical characteristics such as absorption maxima, Beer's Law limits, molar absorptivity and Sandell's sensitivity for this method was presented in Table 1. The regression analysis using the method of least squares was made for the slope (a), intercept (b) and correlation coefficient (r) obtained from different concentrations was 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 this method was ascertained by comparing the results obtained with proposed and reference method in the case of formulations and is presented in Table 2. As an additional check on the accuracy of this method, adding known amounts of pure drug to pre-analyzed formulations. Performed recovery experiment and percent recovery values obtained are listed in Table 2. Recovery experiment indicated the absence of interferences from the commonly encountered pharmaceutical additives and excipients.

Thus the proposed method is simple and sensitive with reasonable precision and accuracy. This can be used for the routine determination of Atorvastatin calcium quality control analysis.

Table 1. Optical characteristics, precision and accuracy of the proposed method.

Parameters	Method
λ_{max} (nm)	425
Beer's law limit (µg / ml)	4-20
Sandell's Sensitivity (µg / cm^2 / 0.001 abs. unit)	0.0781
Molar absorptivity (litre. $mole^{-1}.cm^{-1}$)	1.4777
Correlation coefficient (r)	0.9997
Regression Equation (Y)*	
Slope (a)	1.1781
Intercept (b)	0.0001665
% RSD **	0.2905
% Range of errors (95% confidence limits)	
0.05 significance level	±0.2429
0.01 significance level.	±0.3593

*Y = a+bx, where "Y" is the absorbance and x is the concentration of Atorvastatin in µg/ml.
** For six replicates.

Table 2. Estimation of Atorvastatin calcium in Pharmaceutical formulations.

Formulations	Labeled amount mg/vial	% Recovery by proposed method
Vial -1	5 mg	99.96
Vial -2	5 mg	99.98
Vial -3	5 mg	99.97
Vial -4	5 mg	100.3

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REFERENCES

1. The Merck Index, 13th ed., Merck Research laboratories, Merck and co., INC-white house station, NJ, 2001; 149.
2. Satoskr,R.S., Bhandarkar,S.D. and Nirmala, N.R., *Pharmacotherapeutics*", 19 ed, Popular prakashan, 2005; 581.
3. Erturk S.,Sevinc Aktas, E.,Ersoy,L.and Ficicioglu,S.,*Journal of Pharmaceutical and Biomedical Analysis,* 2003; **33**(5), 1017.
4. *Analytical Letters*, 2003; **36**(12), 2669.
5. Syamsundar,B.,Devalarao,G.and Das,V.G.,*Acta Ciencia Indica,* 2004; **30**(4), 263.
6. Reddy, M.N., Reddy, D.S., Sankar, D.G. and Sridhar, *The Eastern Pharmacist*-March 1998; 119.
7. Sastry, C.S.P., Nadiu ,P.Y. and Murthy, S.S.N., *The Eastern Pharmacist*. Jan, 1997; 133.
8. Syamsundar,B.,Gupta,M.E.and Devala Rao,.g., *Acta Ciencia Indica,* 2004; **30**(3), 249.
9. Chowdary, K.P.R. and Devala Rao ,G., *Indian Drugs,* 1997; **34**(5), 283.