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Spectroscopic Method For Estimation of Atorvastatin Calcium in Tablet Dosage Form

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ABSTRACT: The present study describes development and validation of UV-spectroscopic method for estimation of Atorvastatin calcium in tablet dosage form. During development of analytical method water, phosphate buffer, methanol were tried but drug was found to be soluble in methanol. Standard stalk solution was prepared in methanol. λ_{max} was found to be 246nm. Calibration curves were prepared. The proposed method obeys Beer's law in the range of 5-25 µg/ml. Absorption maxima was determined with 10 µg/ml by scanning in the range of 200-400nm. % Recovery studies are in the range of 99.96%-100.03%. The method was validated in terms of linearity, precision and accuracy. Results of analysis were validated statistically and by recovery studies. From that it was observed that there is no interference of impurities or excipients during the estimation of drug in formulation. This shows the adaptability of the method for routine estimation of Atorvastatin calcium in tablet dosage form.

KEYWORDS: Atorvastatin calcium; Estimation; Spectroscopic Method; Validation.

INTRODUCTION

Atorvastatin calcium is a drug of statin class. It is used in elevated blood cholesterol levels. It is chemically [R-(R*,R*)]-2-(4-fluorophenyl)-b,d-dihydroxy-5-(1-methylethyl)-3-pheny1-4[(phenylamino)carbonyl]-1H-pyrrole-1-heptanoic acid, calcium salt (2:1) trihydrate. It's molecular formula is $C_{66}H_{68}CaF_2N_4O_{10}$ and its molecular weight is 1209.42. It is a synthetic cholesterol lowering agent. [1]

Few HPLC, Mass spectroscopy, HPTLC methods were reported for determination of Atorvastatin calcium. Literature survey revealed that no simple UV method has been reported to the best of our knowledge. So emphasis was given to develop simple, sensitive, selective, precise and accurate UV method for determination of Atorvastatin calcium in tablet dosage form.

MATERIALS & METHODS

CHEMICALS AND REAGENTS:

Atorvastatin calcium was obtained as gift sample from Shri Krishna Pharma Ltd. Hyderabad. Atorvastatin calcium Tablets (20mg) were procured from local market. Methanol of analytical grade was used.

INSTRUMENT USED:

UV-Visible double beam spectrophotometer (Jasco V-530)

METHODS:

Solubility of drug

50mg Atorvastatin calcium of was weighed and solubility of this sample was checked in water, methanol and phosphate buffer. The drug was found to be soluble in methanol.

Identification of λ_{max} of Atorvastatin calcium

50mg of drug was weighed and was dissolved in 50ml of methanol (1mg/ml). 10ml of this solution was withdrawn and volume was made upto 100ml. Appropriate dilutions were made with methanol to give concentration of 10 µg/ml, scanned in UV range from 200-400nm, which could be utilized for analysis and spectrum was recorded (Fig.1).

Preparation of standard stock solution

50 mg of pure Atorvastatin calcium was accurately weighed and transferred to 50ml of volumetric flask. Drug was dissolved in methanol and volume was made up to 50ml. The concentration of drug was 1mg/ml. 2.5ml of this solution was taken in a 25ml volumetric flask and volume was made up to the mark with methanol. Thus Atorvastatin calcium of strength 100 µg /ml was obtained.

Procedure for plotting calibration curve of pure drug

From the standard stock solution 0.5ml ,1ml ,1.5ml, 2ml, 2.5ml dilutions were made in 10ml volumetric flask and volume was made upto the mark with methanol to obtain concentration in range of 5-25 µg/ml. The spectra were recorded, absorbances were measured at 246nm (Table 1) and calibration curve was plotted (Fig. 2).

Procedure for plotting calibration curve of Atorvastatin calcium tablet

20 Tablets were procured from local market and average weight was determined. The powder equivalent to 50mg of Atorvastatin calcium was weighed accurately and dissolved in 50ml of methanol, shaken for ten minutes and filtered. 2.5ml of this solution was taken in a 25ml volumetric flask and volume was made up to the mark with methanol. Thus Atorvastatin calcium of strength 100 µg /ml was obtained.

The solution was diluted in 10 ml volumetric flask with methanol to get a solution of 5,10,15,20,25 µg/ml. Absorbance was measured at 246nm against reagent blank (Table 1) (Fig.3).

VALIDATION OF ANALYTICAL METHOD

Procedure for Precision study of pure drug

10 µg/ml solution of drug is selected for precision study. Appropriate dilutions were made from the standard stock solution to get concentration of 10 µg/ml. Procedure was repeated for 6 times. Absorbances were measured at 246nm (Table 2).

Procedure for Precision study of Atorvastatin calcium tablet

Tablets were procured from local market and average weight was determined. The powder equivalent to 50mg of Atorvastatin calcium was weighed accurately and dissolved in 50ml of methanol, shaken for ten minutes and filtered. The filtrate was appropriately diluted with methanol to get a solution of 10 µg/ml. Absorbance was measured at 246nm against reagent blank. This procedure was carried out 6 times (Table 2).

Procedure for recovery studies

20 Tablets were procured from local market and average weight was determined. The powder equivalent to 50mg of Atorvastatin calcium was weighed accurately and taken in 3 separate 50 ml volumetric flask. To this 40mg, 50mg, 60 mg pure drug was added (for 80%, 100% and 120% recovery). 50ml of methanol was added to make up the volume, shaken for ten minutes and filtered. 2.5ml of this solution was taken in a 25ml volumetric flask and volume was made up to the mark with methanol. Thus Atorvastatin calcium of strength 100 µg /ml was obtained.1ml of this solution was diluted in 10ml volumetric flask upto the mark with methanol and absorbance was measured at 246nm. This procedure was carried out for 3 times (Table 4,5).

RESULTS & DISCUSSION

Sr. No.	Concentration (µg/ml)	Pure drug Absorbance at 246 nm	Tablets Absorbance at 246 nm
1	5	0.23976	0.24859
2	10	0.48377	0.47618
3	15	0.71987	0.70199
4	20	0.95515	0.97539
5	25	1.22341	1.22341

Table 1 Calibration curve of pure drug and tablets

Sr.No.	Label Claim (µg/ml)	Precision for pure drug		Precision for tablet	
		Amount found (µg/ml)	% of Label claim	Amount found (µg/ml)	% of Label claim
1	10	9.94	99.40	9.92	99.20
2	10	10.00	100.00	9.94	99.40
3	10	9.94	99.40	9.96	99.60
4	10	9.95	99.50	10.2	102.00
5	10	10.07	100.70	9.91	99.10
6	10	10.07	100.70	10.04	100.40

Table 2 Precision study for pure drug and tablets

Type	Mean	Standard Deviation	Coefficient of variance	Standard mean error	Lower 95% Confidance limit	Upper 95% confidance limit
Pure drug	99.95	0.6221	0.387	0.2540	99.297	100.6
Tablets	99.95	1.106	1.223	0.4515	98.789	101.11

Table 3 Statisatical validation for precision study of pure drug and tablet

Sr. No.	Level of % Recovery	Initial amount present (µg/ml)	Amount of standard Added (µg/ml)	Total Amount present (µg/ml)	Total amount Recovered (µg/ml)	% Recovery
1	80	10	8	18	18.00	100.17
	80	10	8	18	17.96	99.77
	80	10	8	18	18.03	100.16
2	100	10	10	20	19.80	99.00
	100	10	10	20	20.32	101.60
	100	10	10	20	19.87	99.35
3	120	10	12	22	21.96	99.81
	120	10	12	22	21.99	99.95
	120	10	12	22	22.03	100.13

Table 4 Recovery Studies

Level of % Recovery	% Mean Recovery	Standard Deviation	Coefficient of variance	Standard mean error	Lower 95% Confidence limit	Upper95% confidence limit
80	100.03	0.2281	0.05203	0.1347	99.467	100.60
100	99.98	1.411	1.99083	0.8146	96.478	103.49
120	99.96	0.1604	0.02573	0.09262	99.565	100.36

Table 5 Statisatical validation for recovery studies

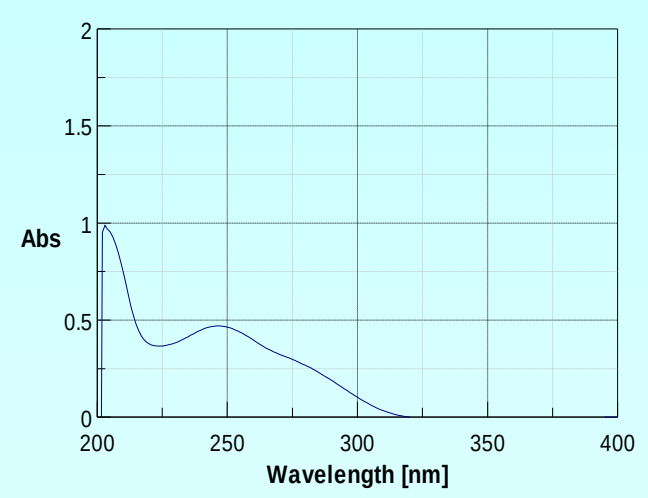

Figure 1 λmax of Atorvastatin calcium

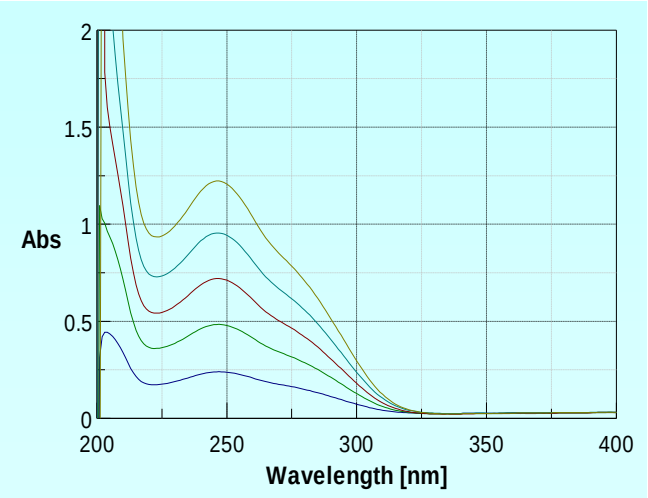

Figure 2 Calibration curve of pure drug at 246 nm

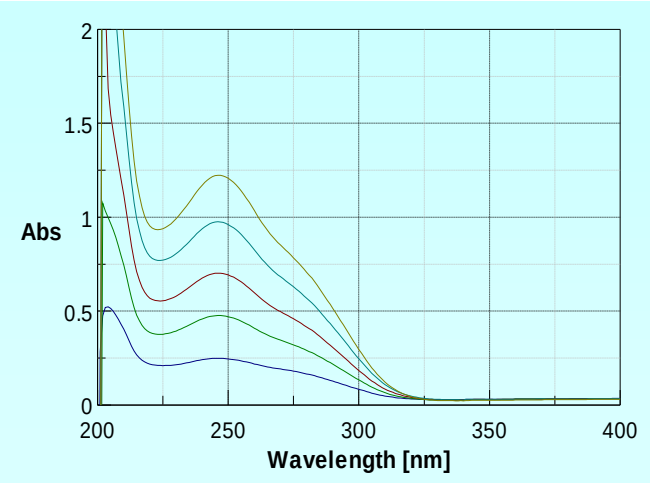

Figure 3 Calibration curve of Atorvastatin calcium tablet at 246nm

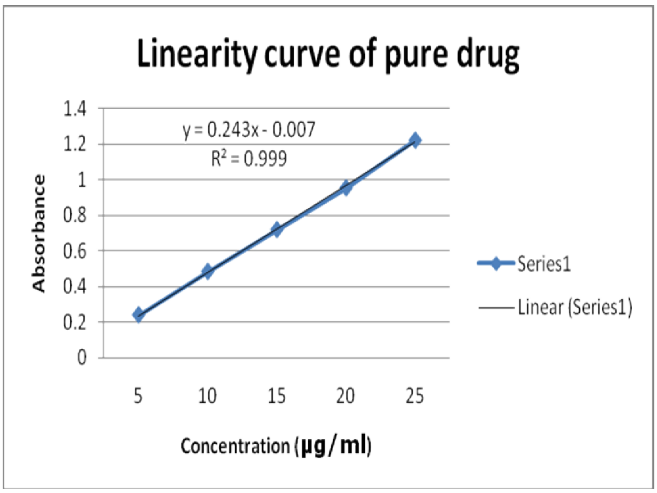

Figure 4 Linearity curve of pure drug

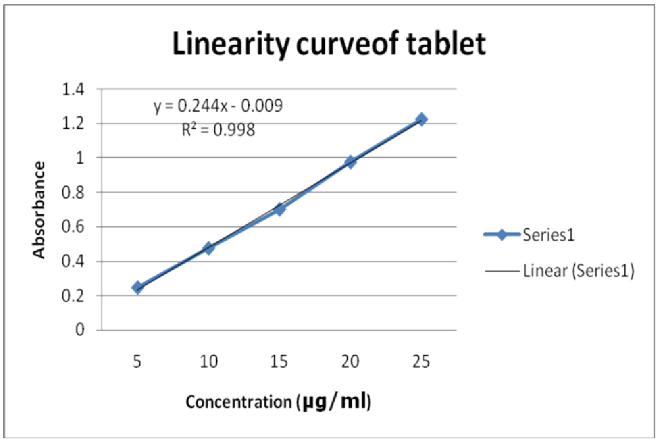

Figure 5 Linearity curve of Atorvastatin calcium tablet

The drug was found to be soluble in methanol. λ_{max} of Atorvastatin calcium was found to be 246 nm(Fig.1). From the linearity curve it was observed that Atorvastatin calcium obeys linearity within concentration range 5-25 µg/ml. Correlation coefficient and

regression line both shown in fig. 4 and 5 for pure drug and tablets respectively. Precision study results with statistical validation have shown in table 2 and 3 for pure drug and tablets. These results show that the proposed method is precise.

The recovery study results with statistical validation have shown in table 4 and 5 shows accuracy of method and level of interference of excipients for the proposed method.

CONCLUSION

Analytical method development mainly involves method which is precise, simple, accurate and having advantages over existing methods. For this purpose literature survey was carried out which was found to be beneficial further developing a method. Literature survey revealed no reported UV –Visible spectrophotometric method till date reported to the best of our knowledge. So for the consideration of simplicity, economy and rapidity, attempts were made to develop simple, fast, accurate and precise method for estimation of Atorvastatin calcium in tablet dosage form.

In an experimental part using Jasco V-530 Spectrophotometer estimation of Atorvastatin calcium in tablet dosage form was carried out. For all results obtained from the experimental statistical tests were applied and it revealed that results were significant.

Thus simple, fast, accurate and precise method was developed and can be used for the estimation of Atorvastatin calcium in tablet dosage form.

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