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Spectrophotometric Estimation of Simvastatin in Bulk and Tablet Dosage Form

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ABSTRACT

A simple, accurate, precise, sensitive and a highly selective spectrophotometric method was developed for the simvastatin in bulk and tablet dosage form. The estimation of simvastatin was carried out at 238nm. The method was found to be linear in the range of 2-18 µg/ml with recovery of 99.6%.The developed method was validated according to ICH guidelines and it found to be accurate and precise. Thus the proposed method can be successfully applied for determination of simvastatin in routine analysis work.

Keywords: Simvastatin, Spectrophotometric, Linear.

INTRODUCTION

Simvastatin (SIM) butanoic acid, 2,2dimethyl-, 1,2, 3, 7, 8, 8a-hexahydro-3, 7-dimethyl-8- [2(tetrahydro-4-hydroxy-6-oxo-2H-pyran-2-yl)-ethyl]-1-naphthalenyl ester, is a lipid-lowering agent that is derived synthetically from fermentation products of *Aspergillus terreus*1. After oral ingestion SIM, which is an inactive lactone, is hydrolyzed to corresponding b-hydroxy acid leading to the inhibition of 3-hydroxy 3-methyl glutaryl – coenzyme A. (HMG- CoA) reductase, responsible for catalyzing the conversion of HMG CoA to mevalonate, which is an early and rate limiting step in cholesterol biosynthesis(Nilesh jain *et al*., 2009).

The drug is officially listed in the 2004 United states of pharmacopoeia and official method of determination is high performance liquid chromatography. Various other methods are reported such as second derivative spectrophotometry, high performance liquid chromatography, mass spectrometry and gas chromatography. Ultraviolet spectroscopic method has been suggested as a method for the determination of simvastatin in methanol has been reported. Analytical parameters for the method have also been established.

MATERIALS AND METHODS

Instrumentation

The present work was carried out on Shimadzu UV-1800 series spectrophotometer having double beam detector configuration. The absorption spectra of reference and test solution were carried out in a 1 cm quartz cell over the range of 238nm.

Reagent and chemicals

Simvastatin was obtained as gift sample from Mylan laboratories, Hyderabad. AR grade methanol was obtained from Merck chemicals, Mumbai, India.

Experimental condition

According to the solubility characteristics of drug methanol was selected as solvent for analysis. From the overlay spectra wavelength was selected for the estimation of simvastatin at 238nm.

Standard stock and sub stock solution

UV analysis was done by using the standard stock solution of 1000 µg/ml of simvastatin 100mg of standard drug dissolved in methanol. Aliquots of 2, 6, 10, 14, 18mg/ml were prepared by using this stock solution and diluted with distilled water, for the preparation of calibration curve.

Method validation studies

Linearity

The linearity of the method is its ability to elicit test results that are directly proportional to the concentration of the analyte in samples. The calibration curve was taken in the range of 2-18µg/ml. For simvastatine at the respective λ_{max} i.e; 238nm. The correlation coefficient of the linearity was found to be 0.999.

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Precision

The precision of an analytical method is determined by assaying a sufficient number of aliquots of a homogeneous sample to be able to calculate statistically valid estimate of % Relative Standard Deviation (%RSD). Intermediate precision was done to express within laboratory variation, on different days. Five replicates of 8µg/ml concentration of the working standard mixture and sample solution were analysed %RSD was found to be less than 2%.

Table.1 Calibration of standard Simvastatin bulk drug

S.No	Concentration (µg/ml)	Absorbance at 238nm
1	2	0.129
2	6	0.336
3	10	0.532
4	14	0.726
5	18	0.957

Table.2 Intra-day precision (n=6)

Sample	Concentration (µg/ml)	Day	Absorbance at 238nm	%RSD
Simvastatin	8	1st	0.422	0.974
			0.416	
			0.415	
			0.418	
			0.426	
			0.420	
		2nd	0.420	0.906
			0.418	
			0.411	
			0.416	
			0.421	
			0.414	
		3rd	0.422	1.05
			0.410	
			0.416	
			0.417	
			0.420	
			0.415	

Table.3 Inter-day precision (n=6)

Sample	Concentration (µg/ml)	Absorbance at 238nm	% RSD
Simvastatin	8	0.422	0.974
		0.416	
		0.415	
		0.418	
		0.426	
		0.420	
	10	0.532	0.765
		0.536	
		0.540	
		0.530	
		0.529	
		0.533	
	12	0.602	0.359
		0.599	
		0.598	
		0.600	
		0.604	
		0.601	

Table.4 Recovery studies

Recovery range	Test Concentration (µg/ml)	Amount of concentration spiked (µg/ml)	Amount of sample recovered (µg/ml)	Avg. amount of sample from calibration graph	% Recovery	% RSD
75%	8	6	8.01	14.01	100.1	0.46
		6	7.97	13.97	99.5	
		6	7.95	13.95	99.2	
100%	8	8	8.025	16.025	100.3	0.19
		8	8.083	16.083	101.1	
		8	8.044	16.044	100.5	
125%	8	10	8.095	18.095	1009	0.19
		10	8.076	18.076	100.7	
		10	8.056	18.056	100.5	

Table.5 Method validation parameters

Parameter	Result	
λ_{max} of the Drug	238nm	
Beer's limit	2-20(µg/ml)	
Linearity : Regression Equation : Y= mX + C Slope (m) Intercept (C)	 y = 0.0512x + 0.0245 0.0512 0.0245	
Correlation Coefficient (R^2)	0.9991	
LOD	0.03270 µg	
LOQ	0.096 µg	
Precision studies	Intra-day % RSD	0.974(8µg/ml)
		0.765(10 µg/ml)
		0.359(12 µg/ml)
	Inter-day % RSD	0.974 (1st day)
		0.906(2nd day)
		1.05 (3rd day)

Fig. 1 Uv Spectrum Of Simvastatin Bulk Drug

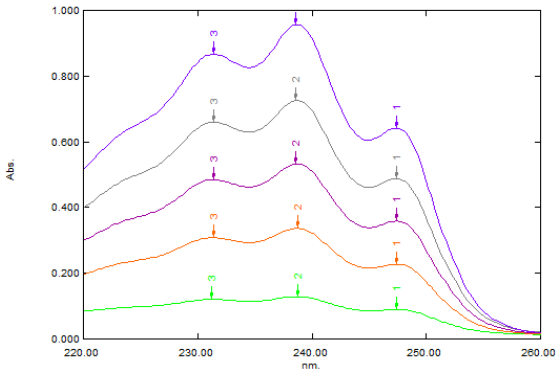
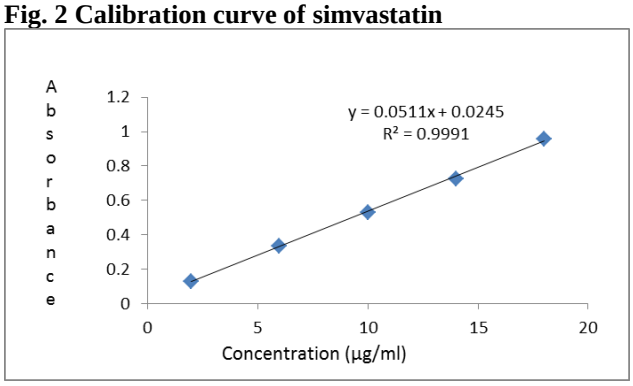


Fig. 2 Calibration curve of simvastatin



RECOVERY STUDIES

In order to ensure the reliability and suitability of the proposed method, recovery studies were carried out. It was done by mixing known quantity of standard drug with formulation sample and the content were reanalysed by the proposed method. To a quantity of formulation equivalent to 10 mg of simvastatine, standard drugs of simvastatine added at 75%, 100% and 125% levels. This was extracted diluted and reanalysed as per the formulation procedure. Absorbance was noted at respective wavelength. Recovery studies were repeated for six times and shown in below table.

RESULT AND DISCUSSION

The proposed methods for simultaneous estimation of simvastatin in tablet dosage form were found to be simple accurate economical and rapid. The % RSD was found to be less than 2% in the developed method. Hence proposed method may be used for routine analysis of the drug.

CONCLUSION

A simple, rapid, and economical spectrometric method was developed for the estimation of simvastatin in bulk and tablet dosage forms. The linearity, accuracy, precision studies and recovery studies were performed for the drug. The relative standard deviation was also

calculated. The results obtained were found to be good and sensitive. The method was validated and was found to be accurate, precise and sensitive. The tablet dosage forms were assayed by this method. And the results showed good correlation between bulk and tablet dosage forms. The proposed method can be extended to different quality control labs and for routine analysis of simvastatin in bulk and tablet dosage forms.

REFERENCES

Balaji S and A Sunitha. Development and Validation of Spectrophotometeric Method for Simultaneous Determination of Simvastatin and Ezetimibe in tablet formulations. *Pak. J. Pharm. Sci*. 2010;23(4):375-378.

Beckett and Stenlake. Practical pharmaceutical chemistry, Part-2, 5th Edition: 275-284.

BK Sharma. Instrumental Methods of Chemical Analysis, 18th Edition: 39-139.

Chatwal and Anand. Instrumental Methods of Chemical Analysis, 5th Edition: 2.149-2.184.

Gauglitz and Vo-Dinh. Handbook of Spectroscopy, 37-47.

ICH harmonized tripartite guideline, Validation of Analytical Procedures, Q2 (R1).

Izetemib, Pavia, Lampman Kirz. Introduction to Spectroscopy, 3rd Edition, 353-389.

J Michale Hollas. Modern Spectroscopy, 4th Edition: 289-313.

Nilesh Jain, Ruchi Jain, Hemant Swami, Deepak Kumar Jain. RP-HPLC Method for Simultaneous Estimation of Simvastatin and Ezetimibe In Bulk Drug and Its Combined Dosage Form. *Asian J. Research Chem*. 2008;1(1):29-31.

Nilesh Jain, Ruchi Jain, Hemant Swami, SharadPandey, Deepak Kumar Jain. Spectrophotometric Method for Simultaneous Estimation Of Simvastatin And Ezetimibe In Bulk Drug And Its Combined Dosage Form. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2009;1(1):170-175.

PD Seth. Quantitative Analysis of Drugs and Formulations, 4th Edition:1-19.

PN Sable, GM Chaulang, AV Bhosale. Novel Spectrophotometric Estimation of Izetemib, Losorton and Simvastatin using Hydrotropic Solubilizing Agents. *International Journal of ChemTech Research*. 2009;1(4):1393-1397.

Radhika Bhaskar, Vineet Singla, Rahul Bhaskar. Simultaneous Estimation of Simvastatin and Metformin Hydrochloride in Bulk and Solid Dosage Forms. *Rasayan J.chem*. 2010;3(3):507-513

Remington. The science and practice of pharmacy, Vol-1,21st Edition: 647-650.

Skoog, West, Holler, Crouch. Fundamentals of Analytical Chemistry, 8th Edition: 710-783.

Varsha Balkrishna Mane, Surekha Babar, Nita Kulkarni. Development of UV Spectrophotometric Method for the Simultaneous Estimation of Simvastatine and Ezetimibe in Tablet Dosage Form by Simultaneous Equation and Absorbance Ratio Method. *International Journal of Pharm Tech Research*. 2011;3(3):1459-1466.

Vogel's text book of Quantitaive chemical Analysis, 5th Edition, ELBS Longman, 661-672.