WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES
SJIF Impact Factor 6.647
Volume 7, Issue 1, 623-629 Research Article ISSN 2278 – 4357

SPECTROPHOTOMETRIC METHODS FORMULATIONS ESTIMATION OF NIACIN AND SIMVASTATIN IN TABLET DOSAGE FORM

Dhamdhere Rupali Balasaheb*, Varsha A. Dighe and Manjusha C. Nevase

Kasturi Shikshan Sanstha's, College of Pharmacy, Shikrapur.

Article Received on
26 October 2017,
Revised on 14 Nov. 2017,
Accepted on 06 Dec. 2017
DOI: 10.20959/wjpps20181-10680

***Corresponding Author**
Dhamdhere Rupali Balasaheb
Kasturi Shikshan Sanstha's, College of Pharmacy, Shikrapur.

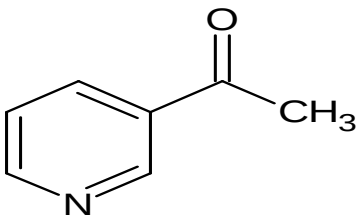
ABSTRACT

Two simple, sensitive, rapid spectrophotometric methods have been developed for simultaneous estimation of Niacin (NIA) and Simvastatin (SIM) in tablets. First method involves solving simultaneous equations based on measurement of absorbance at two wavelengths 263 nm and 238 nm λ max of Niacin and Simvastatin, respectively. Second method is based on absorbance ratio method (QAnalysis). Beer's law was obeyed in the concentration range of 2-20µg/ml and 2-20µg/ml for Niacin and Simvastin, respectively. The methods were validated as per ICH guidelines. Statistical analysis proved that the methods were accurate, precise, and reproducible for analysis of Niacin and Simvastatin in tablets. The wide linearity range, sensitivity, accuracy and simple procedure imply that the proposed technique demonstrated to be appropriate for routine analysis and quality control assay of tablets.

KEYWORDS: Niacin, Simvastatin, simultaneous equation method, absorbance ratio method. (Q Analysis)

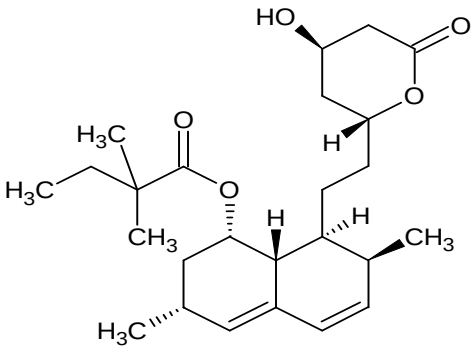
INTRODUCTION

NIA chemically designed as Pyridine 3 carboxylic acid which reduce triglyceride levels is also effective for increasing serum HDL levels it has been demonstrate that this drug lowers the incidence of coronary heart disease in humans. A number of analytical methods have been developed for its determination in pharmaceutical formulation or its in biofluides either alone or in combination with other drugs. Such as determination of niacin by HPLC, floe injection TLC, HPTLC, Capillary eletrophoric and mass spectrophotometric etc.



Niacin

Simvastatin (SIM) is -(+)-{1S,3R,7S,8S,8aR)-1, 2, 3, 7, 8, 8a-hexahydro-3,7-dimethyl-8-[2-(2R,4R)-tetrahydro-4-hydroxy-6-oxo-2H-pyran-2-yl]-Inaphthyl-2,2-dimethyl butanoate [Fig. 2]. It acts by inhibiting HMG CoAreductase and is used for the treatment of hypercholesterolemia. After oraladministration, this prodrug is converted into â-hydroxyl acid of Simvastatin, which is a potent inhibitor of HMG CoA reductase; a key enzyme required for the synthesis of cholesterol in liver. Literature survey releved several methods based on different techniques like UV method, HPLC, HPTLC,LC/MS/MS for its detection in pharmaceutical metabolites in serum.



Simvastatin

Literature survey revealed spectrophotometric and chromatographic methods reported for estimation of (NIA) and (SIM) individually or in combination with other drugs. However, there is no analytical method reported for the simultaneous determination of these drugs in a pharmaceutical formulation. Present work describes simple, rapid, accurate and precise method for simultaneous determination of NIA and SIM in tablets. The proposed methods were validated as per ICH guidelines.

MATERIALS AND METHODS

Solvent Selection

After assessing the solubility of both drugs in different solvents methanol was selected as common solvent for developing spectral characteristics.

Instruments

A double-beam Shimadzu UV- Visible spectrophotometer, 1800 Pharm spec, with spectral bandwidth of 01 nm, wavelength accuracy ± 0.5 nm and a pair of 1-cm matched quartz cells was used to measure absorbance of solution.

Preparation of Standard Stock Solution

Stock Solution A-Accurately weighed quantity of NIA (25 mg) was transferred to 25 ml Volumetricflask. Then methanol was added and ultrasonicated for 5 min and diluted up to the mark with methanol. (Concentration: 1000µg/ml).

Stock Solution B- Accurately weighed quantity of SIM (25 mg) was transferred to 25 ml Volumetricflask. Then methanol was added and ultrasonicated for 5 min and dilutedup to the mark with methanol. (Concentration: 1000µg/ml).

Method I: Simultaneous Equation Method

For the selection of analytical wavelength, standard solution of NIA (10 µg/ml) and SIM (10 µg/ml) were prepared separately by appropriate dilution of standard stock solution with methanol and scanned in the entire UV range to determine λ_{max} of both the substances. and calibration curves were plotted. Both the drugs obeyed linearity in the concentration range under as mention the the table. Overlain spectra of NIA and SIM are shown in figure1 The concentration of both drugs in mixture can be calculated by using following equations.

$c_{x=} A_2 ay_1\text{-}A_1 ay_2/ax_2 ay_1\text{-}ax_1 ay_2$

$C_{y=} A_1 ax_2\text{-}A_2 ax_1/ax_2 ay_1\text{-}ax_1 ay_2$

Where, A1 and A2 are the absorbance of sample solution at 263 nm and 238 nm respectively. C1 and C2 are the concentrations of NIA and SIM (in mg/ml), in sample solutions. Absorptivity values of NIA at 263 nm and 238 nm,i.e ax_1 and ax_2 respectively.

Similarly, absorptivity values of SIM at 261 nm and 238.5 nm, i.e.ay_1 and ay_2 respectively.

Analysis of marketed formulation

Zocor (1000:21) twenty tablets were accurately weighed average weight of Zocor powdered. An accurately weighed quantity of tablet powder equivalent to 10 mg of powder Transferred to 10 ml volumetric flask and dissolved by sonication with sufficient quantity of methanol and volume was made to the mark with methanol. the solution was then filtered thorough Wthatmann filter paper no 0.41. A 1ml portion of the filtrate was taken in 10 ml volumetric

flask and final volume was adjusted with methanol. the above mixture was analysed at 263 238 250nm wavelengths and values of the absorbance were substituted in respective equation 1 to 4to obtain content of NIA and SIM respectively the result of analysis is mentioned in table -1.

Method II: Absorbance Ratio Method.

In quantitative assay of two components by absorption ratio method (Q Analysis) absorbance were measured at the isobestic point (250nm) and λ_{max} of one of the two component. the λ_{max} of drugs was selected i.e.251 nm by using the following equation. The concentration of sample was calculated.

$C_x=(Q_0-Q_2) \times A_1/(Q_1-Q_2) \times a_1$

$C_y=(Q_0-Q_1) \times A_1/ (Q_2-Q_1) \times a_2$

Where, C_X and C_Y are the concentration of NIA and SIM respectively.

A_1= absorbance of sample at 250nm

Q_0= absorbance of sample at 263nm/ absorbance of sample at 250 nm

Q_1= absorptivity of NIA 238nm/ absorptivity of sample at 250nm

Q_2= absorptivity of SIM at 238nm /absorptivity of sample at 250nm

A_1 and a_1 are the absorptivity values of NIA and SIM at 250 nm respectively.

RESULTS AND DISCUSSION

The developed methods for simultaneous estimation of NIA and SIM were validated as per ICH guidelines.

Accuracy

To check the accuracy of the developed methods and recovery studies were carried out by standard addition method at three different levels (80% 100% and 120%) the results of recovery were satisfactory and are presented in table 2.

Precision (inter-day and intra –day)

The reproducibility of the proposed methods was determined by analysing sample at different time intervals on same day and on three different days The results are presented in table 3.

Limit of detection (LOD) and Limit of quantitation (LOQ)

The LOD and LOQ were separately determined based on the standard deviation of y-intercept of the calibration curve. The limit of detection (LOD) and limit of quantitation

(LOQ) were determined by visual methods as suggested in ICH guidelines which were found to be as per given table no.

CONCLUSION

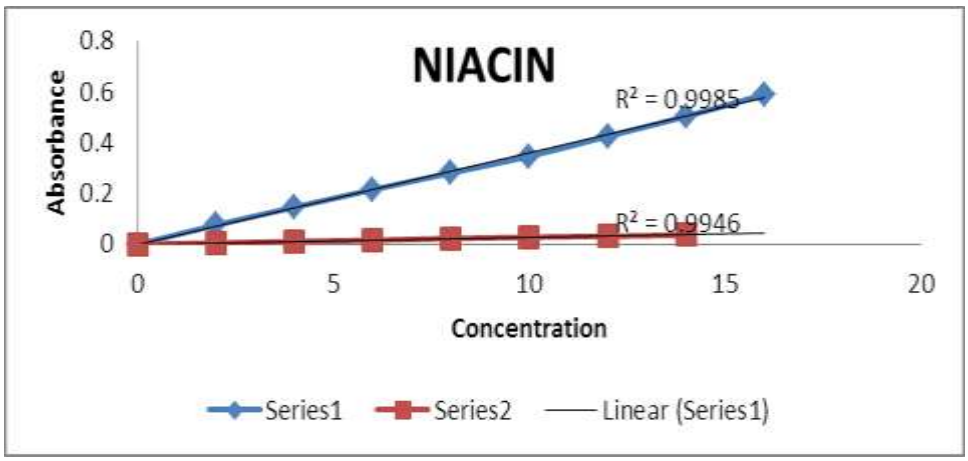
The developed method was validated as per ICH guidelines such as Accuracy, Precision LOD,LOQ, Rougdness,Robustness,and the result of all the parameters are calculated in table 2.

Tablet analysis.

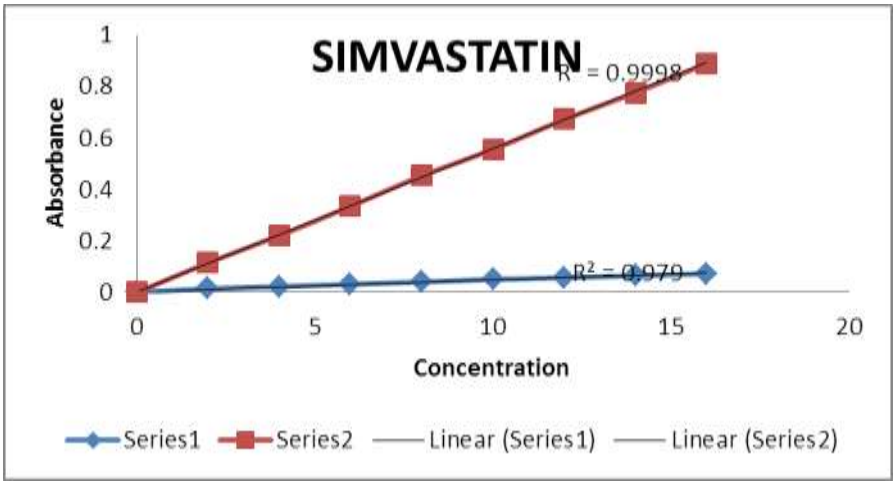
Drug	Label claim (mg/tablet)	Amount of Drug estimated(mg/tablet)		%Label claim		S.D(+)R.S.D	
		Method1	Method2	Merthod 1	Method2	Method1	Method2
NIA	100	110.4	98.97	110	98	0.3119	0.03605

Validation parameter

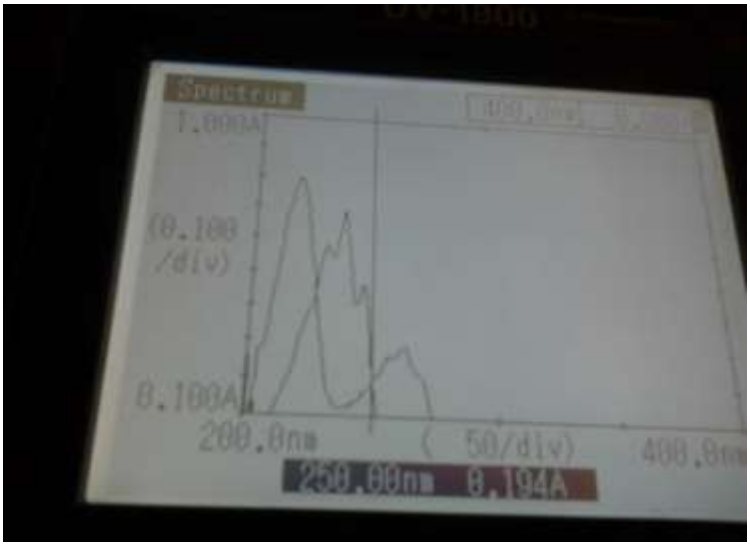
Statistical parameters	NIA		SIM	
Wavelength (nm)	263	250	238	250
Concentration range	2-16	2-16	2-16	2-16
Regression equation (y=mx+c) Slope(m) Intercept(c)	 0.03605 0.04500	 0.002649 0.0033	 0.05549 0.002511	 0.004375 0.00456
Correlation coefficient (r2)	0.9985	0.9948	0.9998	0.9908
LOD (/ml)	0.28	0.86	0.43	0.13
LOQ	0.86	0.13	0.44	0.36
Precision (COV) Interday(n=3) Intraday(n=3)	 0.759 0.940	 0.642 0.932	 0.862 0.954	 0.890 1.325



Standard Calibration curave of Niacin



Standared Calibration curve of simvastatin.



Overlain spectra of NIA and SIM.

REFERENCES

1. Indian Pharmacopeia 1996 volume II The controller of publication, New Delhi, 1038 to 42.
2. Practical Pharmaceutical chemistry, Beckette A.H.;Stenlake J.B.;4th edition, CBS publication, page no 282 to285
3. A Textbook of pharmaceutical analysis Instrumental Methods, volume II A.V. Kasture, K.R. Mahadik, nirakiprakashan, page no 168 to 180
4. Instrumental methods of chemical analysis, G.R.Chtawal, S.K. Anand, himalya publication, page no2.150 to 2.162.
5. The Merck Index, An Encyclopedia of chemical Drugs and Biological MaryadeleJ.O.Neil Eds,14 th edition published by Merck research lab, USA, 2006; 148.

6. Validation of analytical procedure: text and methodology proceedings in International Conference of Harmonization (ICH) Geneva, 2005.
7. D.A Shah,K.KBhatt,Mr.s.Mehta,M.B.Shankar, IJPS 2007,VOLUME 69, PAGE NO 546-549.
8. P.Bonde, S.Sharma, NKourav, AM Attar, IJCST, 2010 PAGE NO 135 TO 142.
9. Sawant Ramesh, Ahmed Raihan, Ramdin Supriya, IRJP 2012,PAGE NO 364 TO 367.
10. Nilesh Jain, et al. Spectrophotometric method for simultaneous estimation of Simvastatin and ezetimide in bulk drugs and its combined dosage form. International Journal of pharmacy and pharmaceutical sciences, 2009 July-Sep.